THE CHEMICAL AGE

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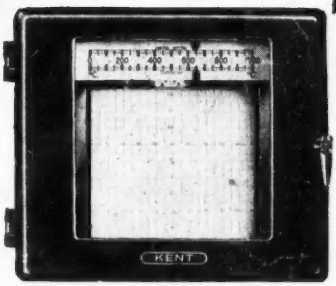

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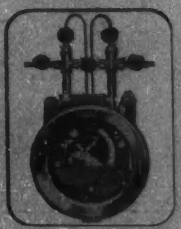

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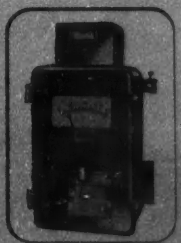

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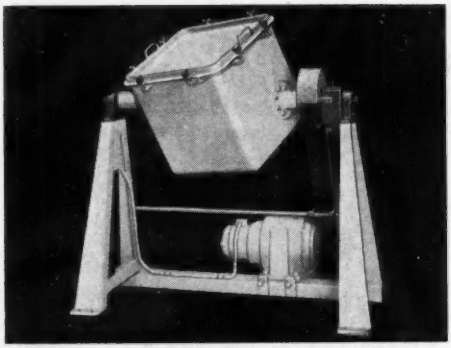

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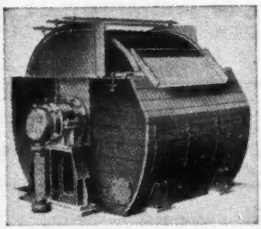

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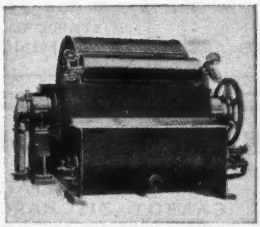

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Management

SPEAKING last year, Sir Stafford Cripps said that he did not think that workers were yet sufficiently experienced to manage industry. Not unnaturally, this remark caused a storm of protest from trade unionists and those who think that a certain amount of theoretical knowledge placed in a suitable chair is qualification enough to manage any industry. Sir Stafford has been called to account for his words. Quite rightly, he has refused to withdraw. He has said: "It is wrong to imagine that because a man is an intelligent worker or foreman, he can—without training—become a good manager. There are in fact very few workers who could take on the jobs of management, not because they are workers but because they have not had the opportunity of training for the job. . . . During the war, as Minister of Aircraft Production, I was very much impressed with the inadequacy of training for management and with the great inequality in managerial skill in the factories which I visited. We are suffering from a lack of managerial skill. That skill can only be obtained by experience and study, and through our intimate acquaintance with all those factors with which management must deal."

Sir Stafford is not the only experienced observer who is critical of present managerial skill. It is obvious that on the Government level the business as a nation has been badly mismanaged during the last 18 months or so. *The Times* in commenting upon the F.B.I. proposals which we discussed last week has said: "The public will look to the great employers' organisation as it has done to that of the trade unions, not only for the counsel which its experience can give to the Government but also for a lead which will help its members to appreciate fully the needs of the times. If productivity is low the fault is very often to be found, apart from short-comings in mechanical equipment which can only be made good gradually, at least as much in management as in labour."

An interesting paper was read to the London and Southern District Junior Gas Association by Mr. W. K. Tate, M.A., on the subject of Management and Administration. Management is an art and Mr. Tate summed up the duties of those who practise that art as "the conduct of the business on sound commercial lines and the maintenance of contentment among the employees." Among the lines upon which management must exercise responsibility are manufacture, sales, distribu-

On Other Pages

tion, finance and labour relations. Mr. Tate, from his experience of the management of gas undertakings, has much of interest to say on the organisation of responsibility throughout an industrial concern and upon the necessity that there should be adequate authority given to those to whom responsibility is delegated. We shall not follow Mr. Tate through his argument beyond quoting one sentence: "Once the fundamentals of a business are grasped, success is dependent on human relationship whether local with staff and employees or, over a wider sphere of contact, with those from whom the business derives its ability to exist." Mr. Tate clearly believes that the management of labour and the maintenance of good relations with customers is the principal task of management.

Some doubt must be expressed as to whether Mr. Tate has put the emphasis in the right place. There are many who embark upon the job of management, and particularly the younger men who hope to do so one day, who are firmly of the opinion that technical knowledge of plant and processes is the only equipment necessary for management. Of course they are wrong; that is the equipment for a chief engineer or a works manager. Mr. Tate, evidently finding that labour problems transcend all others just now, is disposed to maintain that the management of human beings—"human relationships"—is the whole art of management. We are not at all sure whether we should not proclaim him to be wrong also.

The manager and the management—which may or may not be one and the same thing—must be many-sided. If we are to read between the lines of the criticisms made by Sir Stafford Cripps and *The Times* we should hold that the manager must be concerned with the daily operation of the works and with all the various troubles, technical, commercial, financial and human that inevitably occur. But while nearly all of these functions can be transferred to individuals, the viceroys of management, the principal function of management is to be able to survey the world around from a higher pinnacle than that of those who are engaged in the daily task of keeping the wheels of production moving. Management must see that the organisation of a business, the technical plant used in a business, production methods, sales methods, finance, and all the other activities of a firm are kept on a plane with modern developments. The management must be far-seeing. It is to the management that everyone will look for a lead. There may be many who will bring to the manager what they think are good ideas; it is the manager who must take the responsibility of accepting or rejecting them.

The task of those who manage businesses is clearly not an easy one. It is clearly not something that can be undertaken by a man who happens to be a good engineer, a good chemist, or even a good trade union official. There must be training for management and industry and the universities must collaborate in giving that training. It would take us too far to discuss now what is the nature of good training for management. We should anticipate that some training in economics, in banking, in industrial psychology and similar subjects, would be highly desirable. We should also like to see the managers of the future be given a liberal classical education as a basis before specialisation in commercial subjects. We believe that the management should have sufficient working knowledge of the technology of the industry concerned to be able to talk intelligently to the technical men in the industry and to appreciate their point of view. It should not be impossible to pick out in the schools and universities those who are likely to be suitable raw material for training for management. Once they have been put through the managerial course at the university they will require further years of experience in industry before they can be equipped for management. This means that men and women must specialise for management early in their lives. We agree that such a conception is a complete overturning of our present conceptions of managers. To-day managements expect higher salaries than anyone else in the organisation and the post is regarded as the reward for being a good boy and for showing skill in some other profession or trade. Our feeling is that the manager should be regarded on the same plane as the chief engineer or the chief chemist or the head of any other department, even though by reason of his relationship with the board of directors, he will exercise authority over those who may in fact be paid an equal salary.

That is our modern conception of management. There may be many who will disagree with us.

NOTES AND COMMENTS

A Mediocre Budget

THE Budget, announced just before we go to press, does not appear to provide the incentive either to workers or employers which is absolutely necessary for the rehabilitation of British trade and industry. It is an insipid statement, camouflaged perhaps by the smoke of comment over the increase in tobacco and cigarette tax. Among the few tax changes, small reliefs in the shape of the raising of earned income allowance from one-eighth to one-sixth and increased child allowances will no doubt be welcome to small wage-earners, who, however, were probably looking for substantial reliefs in tax on overtime payments. The retention of the purchase tax on so many commodities will not be welcome to the ordinary consumer. Food and other subsidies at £425,000,000, £58,000,000 more than last year, are a drain on the Exchequer which cannot long be endured, and the Chancellor's hint that they will have to be reduced is timely. That no betting tax could be devised is, perhaps, unfortunate, since gambling is a sport which could well afford to pay something to the State for the privilege of continuing its operations. From the business point of view it would seem that the profits tax increase to 12½ per cent from 5 per cent will be unpalatable, but perhaps a sigh of relief that it is not worse may be heard in some quarters. The absence of an appreciable income tax relief will be regretted in many quarters, but it may be that the Chancellor is bearing in mind the fact that any fall in revenue owing to the recent industrial stoppage due to the power crisis will not make itself felt until the next financial year. All in all the budget is in line with recent Government policy, insipid and nothing to write home about.

Tell the Layman

THE remarks of Mr. Geoffrey Heyworth at the luncheon of the Institution of Chemical Engineers on the use of simple language by the scientist in expounding his discoveries has our fullest sympathy. Mr. Heyworth said that the full fruits of science cannot be reaped unless their significance is communicated to other, non-scientific, people. He instanced the sales executive, the accountant and the financial expert as examples of non-technicians who should know what is going on in the scientific field. He pleaded that the simplest language should be used by the scientist in explaining problems or results with the avoidance of technical terms. His suggestion that this might be undertaken even to the point of sacrificing some degree of scientific accuracy, will not, we think, appeal to the scientist whose whole training is along the lines of factual accuracy at all times. But that the scientist can pose his problems in simpler language than is the case at present is a statement at which the majority will not cavil. Mr. Heyworth did not stop at calling for a simplification of language. He also wants more positive statements. Conflicts of opinion too, in Mr. Heyworth's view, should be completely aired, and the reason why one side or the other is chosen frankly stated. Training in a more positive attitude should be given to scientists, thinks Mr. Heyworth, who suggests that this training could quite well be given at the university stage of a technician's career.

No Scientific "Jargon"

THE suggestion that scientists should be able to put across their ideas in everyday English is not new, but that does not mean to say the need is any less urgent. It was implied in a letter to *The Times* by Mr. F. A. Cobb, M.P., who was pleading that small firms, run by owner-managers who have no scientific training should join together in groups to employ at least one qualified scientist. His job would be to act as a "gateway" to the work going on in research associations, the D.S.I.R. and the like, and to explain to the member-firms probable results from the research work. Mr. Cobb's letter pointed out the shortage of trained scientists, although his suggestion of group scientists would have taken up more trained men. We would suggest that if scientists attached to the research associations were to give a layman's account of their work there would then be no need for these suggested "group" scientists. Non-scientific heads of technical firms would be able to understand and appreciate the scientists work, the real value of which would not remain camouflaged behind scientific jargon.

As We Were

AFTER long familiarity with the principle that any news about coal is generally bad news, the Government announcement that basic coal allocations to industry have been increased as from Monday last to 50 per cent of the previous allocation, instead of 33⅓ per cent to which it was reduced at the beginning of last month, is apt to masquerade as a victory. In welcoming the exiguous bonus of 16⅔ per cent—and even a solitary truck-load is likely to be received with disproportionate gratification at this juncture—it should not be overlooked that the present "target" reached still represents certainly not more than half the essential requirements which would permit some of the other production targets to be realised. Thus at the end of the year's first quarter chemical and other industries now find themselves back to the position in which the Cripps' economy plan would have placed them had not the weather made even that impracticable. Now that the malignant influence on the climate which the Government Opposition was suspected of exercising seems to have lost its grip, fuel budgeting should be rather easier because of smaller heat losses and reduced demands for "space heating." Even so, there is still no prospect of reverting to full production, certainly not before May 31 when the present re-allocation period ends, and the knowledge that the introduction on May 1 of the five-day week in the mines will lop 12 million tons from output in the remainder of this year is not conducive to confidence in the future.

Overdue Education

THE Atomic Scientists' Association are to be congratulated on their, shall we say, "temerity" in arranging a one-day school on atomic energy for journalists. It is to be held in the Embryology Theatre, University College, Gower Street, London, W.C.1, on Saturday, April 26. At 10 in the morning Professor Massey is speaking on "Elementary Theory and Military Uses of Atomic Energy" and a discussion is to follow. In the afternoon Professor Pryce, of the Clarendon Laboratory, is speaking on "Atomic Energy and Industrial Power," while the evening session will consist of a talk on "International Control of Atomic Energy" by Professor Peierls. No field of science has caught the public imagination more than that dealing with the atom. And no field of science has been so badly, ludicrously and, on occasion, maliciously reported—or perhaps misreported would be the better word. Journalists knowing only that one has to be careful in handling atoms, but not necessarily in writing about them, have churned out stories on atomic energy or the atomic bomb. These stories have been passed by news editors who know nothing of the atom beyond the fact that they can't get an interview with one. They pass through the hands of sub-editors whose ignorance of the subject is only equalled by their affection for the use of atom or atomic in the heading. Finally, they are read by ignorant laymen; if the story is true it will probably be in language they can't understand because non-scientific journalists could not possibly have put it into two or three syllable words, or if in popular language (and therefore probably untrue) turn from the paper with the remark: "Ain't science wonderful," or "These scientists should be locked up!" That journalists now have the chance to learn something about which they have been writing for nearly two years is gratifying. We hope that many of them will take this busman's holiday, if not for the sake of learning, then for that of their newspaper's readers.

Studious One: ***The gas laws have been in existence for a long time.***

Sporty One: ***Yes, and it's about time Parliament repealed them.***

Institution of Chemical Engineers

Annual Meeting and Luncheon

THE annual meeting and luncheon of the Institution of Chemical Engineers was held at the Connaught Rooms, London, on Thursday, April 10.

Several hundred members and distinguished guests, including the presidents of kindred institutions and societies, attended the luncheon and saw the inauguration of the new president, Mr. H. W. Cremer. The guest of honour was Mr. Geoffrey Heyworth, chairman of Lever Bros., and chairman of the Advisory Council, Department of Scientific and Industrial Research. Other guests included, Dr. G. M. Bennett, Major

The new President, Mr. H. W. Cremer.

Cadman, Sir Edward Appleton, Sir Jonathan Davidson, Professor F. G. Mann, Sir Ben Lockspeiser, Dr. J. C. Swallow, Lord Dudley Gordon, Dr. R. V. Southwell, Dr. D. R. Pye, Dr. Raymond Priestley, Mr. V. Z. de Ferranti, Dr. G. Roche Lynch, Mr. W. R. Beswick, and Sir Charles Goodeve.

After the Loyal toasts had been drunk Mr. Hugh Griffiths, the president, toasting the guests, referred to the mental qualities needed by would-be chemical engineers.

"I noticed a statement in the Press that chemical engineering suffered from intellectual poverty," he remarked, "although a statement elsewhere said that only those of the highest mental capacity should be permitted to enter into courses of chemical engineering instruction. We can take satisfaction, however, from the fact that the good technical men of this country are showing surprising eagerness for admission to our Institution. We have seized the imagination of these young people. They are willing to present themselves for the rather strenuous ordeal which we have devised to keep then out of the Institution. The volume of work they submit to us is very surprising. The fact that the young people believe in us is a measure of the success of this Institution.

"We have to thank the Ministry of Education for starting courses of instruction in different parts of the country. There are difficulties in the way of obtaining teachers, and I am pleased that some of the members of the Institution have been self-sacrificing enough to undertake this work. There is a shortage of students and will be for the next two or three years. We must be content to see our membership grow slowly. I have heard it said that to-day the qualified chemical engineer is the most highly paid technician in this country."

Replying to the toast, Mr. Geoffrey Heyworth said: Industry has great need of competent engineers and has attractive careers to offer to men with the right combination of knowledge, skill, enterprise and energy. I am aware of and hold in high regard the very great amount of careful and anxious thought which the officers, council and members of this Institution have devoted to drawing up a syllabus designed to provide courses of instruction which will equip the student with the basic knowledge, training and outlook to enable him to become a useful member of the profession of engineer in the chemical industry.

The highly technical chemical engineering as we know it is relatively young in comparison with many other industries, and it is perfectly natural that it has created an essential demand in the professional field for new types of specialised technicians, trained and versed in its own special problems, applications and development.

Need for Specialists

In the purely chemical and physical fields such specialists are being provided by the university and other courses, but it appears logical that in order to translate the fruits of research and development from the laboratory into full-scale plant, engineers with a somewhat special training should be required, always provided that undue specialisation at too early an age is avoided.

The concern of which I have the honour to be chairman is primarily a branch of the chemical industry, being largely the industry of animal and vegetable oils and fats, their extraction refinement, processing and

conversion into a great variety of edible and other products. But although it is a chemical industry the resources and skill of the engineer are utilised at every stage from the receipt of the raw material to the packing and distribution of the final product.

In an industry such as ours the engineer-

Mr. Geoffrey Heyworth

ing and chemical sides are so closely associated and interdependent that there are many opportunities for the type of combined training which this Institution is fostering with so much care and thought. There are many problems to be overcome. In the Institution's pamphlet, practical experience in works is regarded as essential. I would suggest, however, that vacation courses may not, in general, be sufficient in themselves to supply this essential practical training. The additional time spent in industrial workshops will well repay the young engineer. By working side by side with skilled tradesmen and others, he will gain a knowledge and understanding which will be invaluable when his time comes to deal with labour and its problems. I am sure that the manager who at some time has worked alongside or, perhaps better, under a craftsman or process operative is most likely to make the most of the human and physical material committed to his care.

Speaking of the long training needed by chemical engineers, Mr. Heyworth said that to acquire the necessary background knowledge at the university and engineering shop often takes five years. Then they join a business which requires them thoroughly to understand a particular process and which may take another five years. Allowing another year for national service, the man is 29 or 30 before he gets a command of his own. Until this age is reached he has made no earnings at all, or at a relatively low level. At this stage in his career his earnings compare unfavourably with commercial executives of the same age, with those engaged in buying, selling, accounting or general office functions. And the difference is not only in salary, but in the effect of remuneration on superannuation.

My own view is that the balance has not always been fairly held between the technicians and the other managerial executives. My own company is making a small experiment to meet this case. An arrangement has been made whereby the student who wishes to continue with post-graduate study after completing his ordinary course is taken on the company's pay roll. His post-graduate work is then arranged with the professor in consultation with the company which undertakes to provide material from its own operations for the use of the student. In this way the student is able to get practical insight at the university into the work of his employer. We hope this experiment will be successful and will justify us and others into extension in other fields.

Mr. Heyworth, referring to the passing on of understandable information by scientists, said the full fruits of science cannot be reaped unless their significance can be communicated to those in other walks of life—the financial expert, the accountant, the sales executive and others. Without this co-operation new projects cannot be launched. It is therefore more than ever necessary that the technician should study how best to present his case to the non-scientist. I will not attempt to do more than sketch the barest outline of what I think are the essentials he should keep in mind.

Simple Language

The technician must expound his problem in the simplest language, avoiding technical terms wherever possible, even to the point of sacrificing on occasion some degree of scientific accuracy. The technician must assume responsibility for positive statements on all matters that lie wholly within his field of knowledge. He should disclose where there is a conflict of opinion in this field and give his reasons why he has come down on one side or the other. He should concentrate on the results which may flow from the results of his proposal, stating clearly what the margins of errors are likely to be. Finally, he should make a definite recommendation one way or the other.

The time has come, continued Mr. Heyworth, when more positive training should be given to the scientist how to tackle tasks of this kind. It seems to me that the right place for this training to take place is at the university stage of his training. From my own discussions with specialists I am confident that more attention to this question is desirable.

Thanking the president for the delightful hospitality, Mr. Heyworth concluded, "I

wish the president success in the remaining time of his office, and the new president a happy term of office and all the members of the Institution continuing prosperity and success."

Mr. Cremer, the new president, was then invested with the badge of office by the retiring president, Mr. Hugh Griffiths, amid acclamation.

"It is with great pleasure that I say that I am sure the authority is passing into competent and strong hands," said Mr. Griffiths.

In reply, Mr. Cremer said: "Mr. President—you are still president until midnight—this is an innovation, and therefore there is no precedent. I do not know how to act or what to say. I do hope that your mantle will bequeath to me some of your felicity of speech and some of your great profound knowledge of our profession. I shall do my best. I have served in several capacities, but they have been more carefree than this one is likely to be. I shall do my best to serve the Institution well."

Before the luncheon, the 25th annual meeting of the Institution was held at the Connaught Rooms. The report of the Council and balance sheet for the year 1946 were received and approved. The following were elected to the offices named: President, Mr. H. W. Cremer; vice-presidents, Mr. S. Irwin Crookes, Major V. F. Gloag, Mr. J. Davidson Pratt and Mr. S. J. Tungay; joint hon. secretaries, Mr. M. B. Donald, Mr. N. O. Newton; hon. treasurer, Mr. F. A. Greene; members of Council, Professor D. M. Newitt, Dr. W. Preston and Mr. C. E. Spearing; associate member of Council, Mr. G. N. Hopton.

The president presented the Osborne Reynolds Medal to Professor D. M. Newitt, the Moulton Medal jointly to Dr. K. B. Wilson and Mr. G. J. H. Tasker, the Junior Moulton Medal to Dr. H. E. Eduljee (*in absentia*) and the William Macnab Medal to Mr. B. J. Gee.

The presidential address, "Crystallisation," followed.

Shale Industry Collapse Forecast

THE collapse of the Scottish shale industry, with all the consequent dislocation of the allied and dependent industries, has been forecast by the National Union of Shale Miners and Oil Workers in their annual report. According to Mr. Walter Nellies, Bathgate, general secretary, the knowledge that the industry is now fighting for its existence has encouraged the Union to press for improvements in working conditions to induce the extra recruitment of manpower which is regarded as the crux of the situation.

Unless suitable extra manpower can be attracted by comparable conditions of employment as apply elsewhere the exodus of younger miners, between 30 and 40 per cent of whom have left the industry since 1943, will be continued and increased. The withholding of outside assistance and the need for a major effort to avoid the collapse of the industry is stressed by Mr. Nellies who advances a four-point programme designed to achieve the continued prosperity of the industry.

Union's Suggestions

He suggests that:

(1) As the shale industry is in competition for the same class of manpower, in the same labour market as the coal industry, competitive or comparable wages, and other conditions of employment be made available for recruits to the shale industry and widely advertised.

(2) Manpower priority be extended to the shale industry, with power to recall experienced shale miners from other industries, and in this regard be put on the same basis as the coal-mining industry.

(3) Underground shale miners be exempted from the National Service scheme, on condition that they remain in the shale mines from their 18th to their 26th birthday if they wish to remain exempt.

(4) The Chancellor of the Exchequer depart from horse-power tax on motor vehicles, and recover loss of revenue in consequence by increasing Excise duty on motor spirit, and fuel oil, at the same time increasing rate of preference on light oil produced from home resources of shale deposits.

Atomic Illness

Full Information Wanted

ATOM research workers in the North-West who have complained of illuesses caused by radio-active substances are to have their case examined by the executive of the Chemical Workers' Union in London. It is likely that a full report will then be laid before the T.U.C. Mr. Bob Edwards, Lancashire area secretary of the Chemical Workers' Union, said, on April 11: "Attention was drawn at the 1946 T.U.C. to the danger of industrial disease from atomic work. We feel that all information on the subject, collected here, in Russia, in America, and elsewhere, should be co-ordinated."

Chemicals from Petroleum

Model on Show at B.I.F.

INDUSTRIALISTS in this and other countries interested in the problem of "production-per-man-hour" will soon have the opportunity of studying a large-scale model of the new plant which, as described in our issue of March 15, is being erected in Cheshire for the manufacture of chemicals from petroleum by the Shell Chemical Manufacturing Co., Ltd. Work on the 85-acre site has already begun and the plant, which will cost several millions, will be constructed almost entirely from United Kingdom materials. It is planned to have it ready for an initial production capacity of about 24,000 tons annually some time in 1948.

The model will be displayed at the British Industries Fair next month as a feature of the chemical section at the Grand Hall, Olympia, where nearly 100 firms in that group will be showing their products.

The output of the plant will probably create a new supply source for many overseas buyers of chemical solvents initially, and later for a number of other chemicals now in the development stage, at the moment only available in quantities suitable for user-manufacturer research.

Ramsay Dinner.—All former Ramsay Fellows of University College, London, whose addresses are known are to be invited to the annual Ramsay Memorial Fellowships Dinner which the Provost of the College, Dr. D. R. Pye, will give on June 26. All who did not receive invitations to last year's dinner are asked to send their addresses to the Joint Hon. Secretaries of the Trust at the University College, Gower Street, London, W.C.1.

The Minister of Food has announced an agreement with Scotch Whisky Association by which permission will be given to the distillers to buy 50,000 tons of barley out of the 1946 crop and subject to harvest, a further 75,000 tons in the autumn out of the 1947 crop. In return, the Association has agreed to raise to 75 per cent the proportion of its current releases for export.

The Government of India has accepted the Tariff Board's recommendations that the present protective duties for the Indian iron and steel industry be allowed to lapse and replaced by revenue duties. Alloy, tool and special steels, high-silicon electrical steel sheets and high-carbon and spring steel wire will continue subject to protective duties pending further inquiry.

Herring Oil Industry

Research Proposals

THE Herring Industry Board plans considerable expansion of last year's quick-freezing work, while expansion of the herring meal and herring oil industries is also anticipated.

Proposals for the Shetlands involve the expansion of the quick-freezing facilities to double the capacity of last year, when an air blast plant was in use. Apart from expected problems in the operation of a somewhat new type of plant, the air blast unit worked excellently. This year, two multiplate frosters, each of 25 cran capacity, will be erected in addition to the air blast unit and will practically double the capacity of the scheme insofar as quick-freezing is concerned. A similar intention is indicated covering kippering, the intention being to kipper and sharp freeze. A second kiln is planned to give a 100 per cent increase on last year's production, when an Airscrew kiln was in use. Both projects are now in the preliminary stages and will be in operation for the start of the season.

It is also anticipated that "klondykers" will take a considerable bulk of the catch again this season, as they did last. The production of fish meal and fish oil will be continued this year on Bressay, under private control. The main outlet for meal has been as cattle feed, while disposal of fish oil is under control of the Ministry of Food.

A policy of research into the methods of canning has been initiated. Most recent information is to the effect that—"The Board, in conjunction with the Department of Scientific and Industrial Research, the Food Manufacturers' Research Association and the Metal Box Co., Ltd., have inquired into the desirability of promoting research and experimental work on the canning of herring. It has been agreed between the bodies named that a fruitful field for investigation is presented by the herring caught in the Clyde area, and, in particular, that the following problems should be studied: (i) the suitability of Clyde, and later of other herring canning; (ii) general problems of fish canning; (iii) widening of the range of canned herring packs. Trials on a factory production scale will be made of innovations or improvements resulting from the investigations."

Soya Meal Production Stopped.—The Clyde soya meal factory has stopped production owing to lack of raw materials and has suspended 150 workers pending the unloading of peanut cargoes now lying in the Clyde, held up by the strike of dockers.

Technical Colleges and Research

F.B.I. Committee Urges Closer Liaison with Industry

BRITISH industries cannot fully or rapidly cope with the formidable tasks which lie before them unless the fullest possible use is made of all available resources for scientific and technical research. Moving from that widely accepted axiom, the Federation of British Industries lately appointed under the chairmanship of Sir Robert Pickard, chairman of the Chemistry Advisory Committee, Appointments Department of the Ministry of Labour, a special sub-committee of the F.B.I. Industrial Research Committee to study the present and potential scope of industrial research in technical colleges. Their task was to study the results of a survey of the subject carried out jointly by the F.B.I. Industrial Research Secretariat and the Ministry of Education, to examine also the Ministry's plans for future industrial research in the colleges and the prospects of closer co-operation by industry. It is with the last field that some of the sub-committee's most promising recommendations are made.

Links with Industry

Of the 57 technical colleges studied, 13 carry out no research at present, 29 carry out some research, and 15 carry out "an appreciable amount of research." More than 300 are engaged in research in the colleges, some 200 being members of the staffs, working for post-graduate degrees, or in the interests of local industries or, in fewer cases, in co-operation with local research associations.

The sub-committee was convinced that an even closer link with industry could be formed with results beneficial to both sides and that most of the colleges are keen to initiate research programmes of this kind and would do so if more adequate facilities, equipment and staff were available.

At present, the extent to which colleges are proving of assistance to local industry as regards research, development and advice is inadequate when measured either in terms of the resources and potentialities of technical colleges on the one hand or the requirements of industry on the other.

Twofold Benefit

The responsibility for the present situation, in the sub-committee's view, does not rest entirely with the colleges. Industry, they consider, is not sufficiently aware of the facilities that exist in technical colleges, or of the assistance they can provide in the solution of industrial problems and the application of scientific knowledge for the benefit of local industry. Research carried out should bear some relation to the principal function of the technical college, which is the advancement and dissemination of knowledge, especially knowledge of value to industry and those engaged in industry.

The development of that policy need not in any way diminish a college's achievement of its main objective—technical training; it will in many cases make that training far more practical and valuable than a purely academic course of study.

In furtherance of these objects the sub-committee makes several practical recommendations, notably that scope for more research by teachers and participation by students should be the *sine qua non* in all senior technical colleges. Among the arguments supporting this are the large unsatisfied demand by industrial research laboratories for qualified workers, whom the colleges might supply more fully; and the benefits which can accrue to college staffs, enabling them to keep more up-to-date in their knowledge of industrial practice and relate their teaching more closely to contemporary needs.

Obviously, the initiative for all such research should come from the industry concerned, and the widest consultation is recommended. Without competing at all with private consultants, colleges could still perform an important body of work, and where the college possesses special apparatus or equipment not available to industry routine tests should be undertaken.

Grants and Loans

In all cases, particularly specialist technical and national colleges, liaison with the appropriate research association should especially be developed. In the past, an impediment to a closer association between the colleges and industry has been the fact that grants and endowments made by the latter have sometimes resulted in the local education authority reducing its contributions by a corresponding amount. This practice is condemned by the sub-committee because it discourages development and industrial interest. They affirm that: "So long as the local authority and Ministry of Education provide adequate financial support then extra research scholarships and endowments from industry as well as grants for and loans of special equipment and plant should be encouraged, as the more effective the collaboration between technical colleges and the industries they are designed to serve, the more fully will the colleges achieves their purpose.

"We feel that there is a positive part that industry can play in the success of the

research work at technical colleges, which in turn will redound to industry's own benefit. Industry should take increasing interest in the technical college, not only as a place where staff can be trained, but as a centre which may be of supplementary assistance to the research activities of the industry and the private consultant in the solution of both general and particular industrial problems." An encouraging factor, so far as grants or gifts or loans of equipment by industrialists are concerned, are that such gifts or loans are now treated for taxation purposes as direct expenditure within the donor's own organisation.

Chemical Research

Appended to the F.B.I. sub-committee's findings is the Ministry of Education's report, "Research in Technical Colleges" (Circular 94; April 8, 1946), which includes a list of colleges and facilities likely to be of interest to industry. Those conducting chemical research are:

Accrington Technical School; Acton Technical College; Barnsley Mining and Technical College; Bath Technical College; Belfast College of Technology; Birmingham Central Technical College; Blackpool Technical College and School of Art; Bolton Municipal Technical College; Bradford Technical College; Bridgend Mining and Technical Institute; Brighton Technical College; Burnley Municipal College; Cardiff Technical College; Chelmsford Technical College and School of Art; Croydon Polytechnic; Dagenham South East Essex Technical College; Gillingham, Medway Technical College; Glasgow Royal Technical College; Guildford County Technical College; Halifax Municipal Technical College; Huddersfield Technical College; London: Battersea Polytechnic, Sir John Cass Technical Institute, Chelsea Polytechnic, Northampton Polytechnic, Northern Polytechnic, Norwood Technical Institute, The Polytechnic (Regent Street, W.), Woolwich Polytechnic; Loughborough College; Manchester College of Technology; Northampton College of Technology (Northamptonshire); Nottingham; Plymouth and Devonport Technical College; Rotherham College of Technology and Art; St. Helens Municipal Technical College; Stroud and District Technical College; Sunderland Technical College; Walthamstow South West Essex Technical College; Wigan and District Mining and Technical College; Wolverhampton and Staffs Technical College.

Colleges having facilities for research in chemistry or metallurgy but not at present undertaking such research include: Blackburn Municipal Technical College; Enfield Technical College; the Borough Polytechnic (London); Middlesbrough Constantine Technical College; Newcastle-on-Tyne Rutherford Technical College; Salford Royal Technical College; Smethwick Municipal College; Wednesbury County Technical College.

A not uncommon problem in chemical and other manufacturing processes is to ensure that a mixed product has in fact received the degree of mixing actually required. The claim of Kestner Evaporator and Engineering Co., Ltd., 5 Grosvenor Gardens, London, S.W.1, is that their stirrers are capable of achieving the required degree of mixing. In leaflet No. 274, just issued, the firm, in descriptive text and diagram, amplifies this claim in respect of its entire range of stirrers. Also newly issued is leaflet No. 272, describing the firm's patent horizontal film evaporator.

Methyl Alcohol from Lignite

REFERENCE has been already made to E. G. Voiret's suggestions for dealing with the present fuel difficulties in France, mainly by a more rational and systematic use of her vast resources of lignite. Those suggestions included, among other things, the gasification of the lignite and the use of the hydrogen and carbon monoxide content of the gas for methyl alcohol synthesis; on the assumption that the removal of these two constituents of the lignite gas would not to any appreciable extent reduce its calorific quality.

Similar proposals had been made earlier, *e.g.*, by P. Lenoir in *Chim. et Ind.*, 1945, *53*, 278-81. He thinks that the use of methyl alcohol as a fuel, especially as an additive to automobile petrol to give a higher octane number and its manufacture from lignite would be of particular interest under present conditions. As to the future there should be no apprehension as to overproduction or falling prices. The present Service des Alcools, or some similar organisation representing the State, producers and users, could be continued as an effective controlling body. Reference is made to a recent book by M. Jalbert "Thermodynamique du moteur polycarburant à injection" providing additional evidence of the value of alcohols, especially methyl, in motor fuels.

Big Alcohol Yield

It is pointed out that, while the Fischer-Tropsch method yields only 80 gr. alcohol per cu. m. of gas, the proposed method from lignite would give, with a less complicated plant, 300 gr. alcohol. Reckoned in terms of lignite 5.5 kilos of this would give 1 kg. of methyl alcohol, including provision for the electric energy required; and this compares very favourably with the Fischer process or hydrogenation where lignite is the starting material. French lignite resources are estimated at about 500 million tons, of which 100 million are in the Fuveau basin alone. With an average annual output of 1.5 million tons lignite the yield of methyl alcohol should be about 300,000. This compares with the German production of 1,858,000 tons in 1942.

The existing comparatively small alcohol works in France, those at Harnes, Béthune, Paimboeuf, Montereau and Pierre-Bénite, have a total output of some 40,000 tons per annum. In the Fuveau district new works are to be installed which also should have an annual output of 40,000 tons, making a total of 80,000 tons. This, in the author's view, ought to be increased to at least 300,000 tons.

CHEMICAL ASPECTS OF NORWEGIAN INDUSTRY TO-DAY

Specially written for THE CHEMICAL AGE by the Studieselskapet for Norsk Industri (Norwegian Industries Development Association), Oslo

(Continued)

SPERM oil, which consists of liquid waxes, is inedible, so that most of it finds it way into the soap kettles. It is an important raw material in the manufacture of textile soaps and other washing agents, of sulphonised oil for the leather industry, of emulsifiers, etc. Spermacetic wax is used as a constituent of fatty and non-fatty creams and other cosmetics. From the hypophysis, gonadotrope hormones, thryreotrope hormones and growth hormones are obtained. Progesterone is obtained from the corpora lutea in the ovaria glands.

A product which has attracted considerable attention lately is cetyl alcohol, which is obtained in the form of cetyl palmitate and is used as a basis for salves in cosmetics.

Blue whale liver, which is very rich in vitamin A, is used as a raw material for vitamin A extracts. Whale oil contains, as a rule, an average of 2500 to 4500 international units of vitamin A per gram. Whale liver is valuable on account of its content of vitamin. Hitherto it has been found difficult to preserve the liver in an adequate manner at the whaling grounds, but attempts are being made to solve this problem. Several factories make a speciality of producing first-class vitamin concentrates from whale liver. This industry was started in the 'thirties and was in rapid growth before the war. Besides whale liver, livers from halibut, tuna fish and other fish, which are rich in vitamins, are used.

A Norwegian company, which is equipped with modern physical and biological laboratories, is carrying out considerable research work in this sphere. The methods it has developed have also been introduced into other countries. Concentrates are produced for most purposes: for vitaminising milk, margarine and other foodstuffs, for the pharmaceutical industry, etc. The quality is in every respect equal to that of foreign concentrates.

Synthetic Vitamins

The production of synthetic vitamins is at present very small. During the war ascorbic acid was manufactured on a large scale, but it is now difficult to compete with foreign factories owing to their greater capacity. Small quantities of vitamin D are produced, but no vitamin B. A few concentrates of natural vitamins B and C are made from Norwegian raw materials, but production is on a small scale and as far as is known none is exported.

Refinement of herring oil gained a powerful stimulus during the war and two or three factories are now engaged in this activity. By hydrogenation and polymerisation the oil is converted into a product which is much used as a substitute for olive oil. The latter was before the war imported from Spain, but it is expected that Norwegian smoked herrings and brislings will in future be packed in Norwegian oil.

Cod liver oil is highly valued on account of its content of vitamins A and D. Capsules of gelatine are made for pharmaceutical purposes, each capsule being equal in vitamin content to one teaspoonful of cod liver oil. They are sold under the names "Vitapan" and "Lofotperler." The normal export of cod liver oil is about 12,000 tons a year. The total export of fish-oil products is 51,000 tons and is apportioned as follows: steamed medicinal cod liver oil, 12,000 tons; crude medicinal cod liver oil, 500 tons; light cod oil, 5000 tons; rubby cod oil, 10,000 tons; burnt dark oil, 400 tons; various oils, 12,000 tons; herring oil, 11,000 tons.

Before the war Norway had one plant for the refinement of mineral oil, with a capacity of 30,000 to 35,000 tons per annum. This plant was, however, completely destroyed by an Allied air attack some days before the conclusion of the war. The question of rebuilding the factory is now being considered.

Margarine Production

Before the last world war, margarine production in Norway amounted to about 60 million kg. per year—*i.e.*, about 20 kg. per inhabitant per year. The high level of margarine consumption cannot be due solely to a somewhat higher need of fats in Norway in comparison with many other countries on account of the cold climate. The high quality of the products from the margarine industry has no doubt contributed to the increased demand. Vitaminisation of margarine was introduced in Norway earlier than in any other country. The production of the largest margarine plant was vitaminised under scientific control as early as 1925.

The Act which came into force in the

early 'thirties, making compulsory admixture of butter with all margarine produced in Norway, created several technical difficulties for the margarine industry. The admixture was first of all apt to produce "fishiness" in the margarine. These difficulties have now been overcome by the leading producers as a result of extensive research work.

During the German occupation the supply of ordinary vegetable fats from abroad was cut off. For a long time the only available raw material was herring oil. The latter was hardened in Norwegian hydrogenating plants and it became possible to produce a satisfactory margarine, neutral in taste and with good consistency. At present the main raw material in the margarine industry is hydrogenated whale oil. Coconut oil and vegetable oils are, however, again beginning to reach the country.

Rennet casein is produced by the cheese-making industry in quantities of approximately 1700 tons a year. Experience has shown that this casein can be used with as good results as precipitated casein.

The pre-war output of the Norwegian breweries, 27 in number, was 543,000 hl. During the war it rose to nearly 800,000 hl.

It is a natural consequence of Norway's long coastline that the fisheries should form an important industry. On the basis of this a canning industry has developed, the products of which are exported to all parts of the world. Before the war these exports amounted to about 36,000 tons, or 45 million kr. in value.

Vitamin Research

In order to maintain the industry at a high level, a research laboratory—*Hermetikkindustriens Laboratorium*—was built at Stavanger in 1925. Very valuable work has been done by this laboratory, not least in the field of vitamin research. The problem of corrosion has also been tackled. It has been found that the presence of oxygen from the air is only a minor cause of corrosion. The real cause is the trimethylamine oxide present in the fish products. The content of this chemical varies considerably at different seasons of the year. By corrosion, the trimethylamine oxide is reduced to trimethylamine, which gives an alkaline reaction and has an odour similar to that of ammonia.

Norway has normally exported about 3000 tons of seaweed meal a year, for the most part produced from *fuci*. This seaweed meal is well suited to serve as a cattle fodder. One factory making seaweed meal with a low salt content has found a good market abroad for its product. The modern refinement of seaweed is chiefly based on the extraction of alginic acid. This chemical was of considerable importance during the war in the food industry as well as in the soap and textile industries. The alginic acid is extracted mainly as sodium alginate. Much research work has been done to make this product free from odour and colour, and to give it the highest possible viscosity. The types of seaweed chiefly used are *Laminaria digetata* and *Laminaria clousdony*, but attempts are also being made to use *Chondrus crispus* and similar species (carrageens) as these would furnish a product resembling agar-agar.

Plant gelatine is made from red algae (*Rhodophyceæ*) by extracting the gelose contained in these plants. Fucuoidin and mannitol are also produced.

Seaweed Products

Norway, with its long coastline, has particularly favourable conditions for obtaining large quantities of seaweed and kelp, so that it is only a matter of time when new and even more valuable products will be forthcoming in this sphere.

From a very modest beginning, the paint and lacquer industry has developed until it is now one of great importance to the country, and it is expected that its products will soon be found in foreign markets. A new plant is now under construction which will produce alkyd resins, and synthetic resins suitable for the paint and lacquer industry.

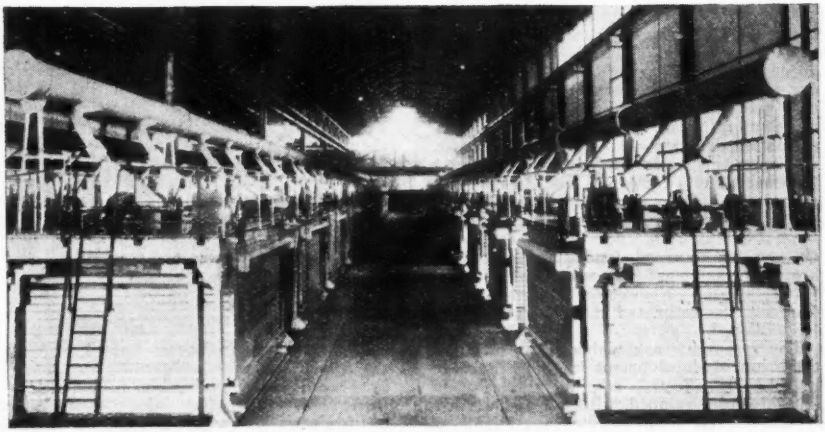
During the war, oil from marine animals was used as a substitute for linseed oil and wood oil. Two oil-refining factories in particular have made good progress in preparing such oil, usable in the manufacture of enamels and paints. At present this oil cannot be used alone, but in combination with wood oil it gives excellent results. Of the marine oils, chief interest attaches to herring oil. Before it can be used, that part of the glycerides which segregates when cooled has to be separated. The oils are refined at a low temperature and the glycerides are then filtered. To improve the quality, it is usual to employ alkaline refinement and bleaching before removal of the glycerides. Extensive tests are also being made to improve the oils by fractional separation of the saturated and unsaturated oils by the aid of solvents. The oils are subjected to a light polymerisation and are dissolved in a suitable solvent —*e.g.*, acetone. By choosing the correct quantity of solvent it is possible to keep the unsaturated oil fraction undissolved while more saturated fractions are being dissolved.

The Pharmaceutical Industry

The pharmaceutical industry in Norway is comparatively young, but it has undergone great development in recent years. At first the Norwegian industry, like other pharmaceutical industries throughout the

(*Above*) **Large-scale production of synthetic pharmaceuticals in Norway.**

(*Below*) **A series of closed aluminium furnaces, with gas collectors.**



world, was mainly occupied in the conversion of purchased drugs into extracts, tablets, syrups, ampules, etc. Its work was almost entirely dependent on foreign materials. This was not a very desirable state of affairs, especially in view of the possibility of isolation in wartime. As early as 1920 there was a manifest inclination toward independent research and production, and in the last five decades there has been a powerful development both in the organotherapeutical and in the biochemical and synthetic fields.

In the organotherapeutical field, Norway is represented by adequate preparations. First may be mentioned liver extracts, for the treatment of pernicious anæmia. A considerable amount of research work on this subject has been done by Norwegian pharmaceutical chemists, and their liver preparation method is used not only in Norway but also in Denmark, Sweden, the United States, Britain and the British Dominions. In the sexual hormone branch of the industry there are preparations of the estrogens (folliculin), which are biological products derived from the urine of pregnant mares, in concentrations of as much as 50,000 international units per ml. There are also posterior pituitary gland preparations (oxytocin), choriongonadotropines and androgen gland preparations. It is perhaps even more important for this country that we have an entirely independent production of thyroxin, insulin and adrenalin.

Pharmaceutical Products

Norway is a small country, with only limited resources. Nevertheless, our pharmaceutical chemists watch carefully the development in other countries and try their hand at syntheses on a small scale. There is only space to mention a few of the most important groups: sulphonamide preparations, barbituric acid derivatives, scabies remedies. Further, the sexual hormones, testosterone and progesterone are synthesised. Important chemical isolation procedures are carried out. We may mention an opium concentrate, a belladonna concentrate and ergotamin tartrate.

It may be mentioned that the Norwegian pharmaceutical factories are solely concerned with the manufacture of special pharmaceutical preparations. Unlike many large foreign firms, they do not engage in the manufacture of foodstuffs, cosmetics, hospital equipment, dressings, etc. The value of the Norwegian pharmaceutical products is estimated to be more than 10 million kr. a year.

The research work which is an essential condition of development in this branch of industry is effected at several first-class laboratories equipped with all modern instruments and staffed by trained scientists. Scientific publications are also regularly issued. In connection with one of the pharmaceutical chemical factories there is a biochemical and biological department, furnished with a menagerie.

There is at present a relatively small production of heavy chemicals, but negotiations are now going on with the heavy industry for the purpose of putting this matter right.

Although the Norwegian pharmaceutical chemical industry is striving to cover Norway's demand for medicines, it is far from the intention to isolate itself. On the contrary, it is the industry's wish to establish productive co-operation with its colleagues in other countries, and contacts have already been formed for the exchange of patents, of technical discoveries and scientific knowledge.

Further Development

Studieselskapet for Norsk Industri (Norwegian Industries Development Association) has been established by private initiative for the purpose of investigating the possibilities of starting new industries in Norway and of extending and modernising existing ones. Most of the chief industrial concerns are members. It has its origin in the conviction that research and investigation are the essential preconditions of development in industrial activity. To satisfy this demand a joint body was formed, which should be at the disposal of the industries and be able to answer questions, make inquiries, suggest plans, and take up problems for solution.

The possibilities for further development of the chemical industries in Norway are good. This is especially the case with such as require for their activities large amounts of electrical energy. Most of the country's water power is at present undeveloped. Of a potential quantity of 9.2 million kW only about 1.4 million, or 15 per cent, is actually in use.

In one respect the chemical industries are more favourably situated than most. Their demand for cheap electrical energy can easily be met, while at the same time they have less need of manual power. This is an important factor in view of the extreme shortage of labour. The chemical industries are, however, dependent on exports for their development, no less than on the supply of raw materials. Until, therefore, normal trade relations are restored all over the world, advancement cannot reach its highest point.

Margarine from Copra.—Danish factories are manufacturing margarine for Poland from copra made available to Poland by Unrra. The first million kilos are now ready for shipment, it is reported from Copenhagen.

Steel Nationalisation

THE probability that the Bill to nationalise the steel industry would be introduced before Whitsuntide was mentioned by Mr. W. Dobbie, Socialist M.P. for Rotherham, at a recent meeting there to stimulate increased production. Several modifications, it is believed, have been made to the draft of the Bill. Belief in the imminence of the steel nationalisation is, however, not shared in informed circles in London, in which it is pointed out that no reference was made in the King's Speech last November to plans to nationalise the steel industry; and the legislation still before Parliament, including six major Bills, does not suggest that further large-scale legislation will be undertaken this session.

Steel and Iron Cut

Big reductions in production of steel and pig-iron resulting from the curtailment of fuel and power supplies in February and March are revealed in the production figures issued this week by the Iron and Steel Federation. Steel production in March fell to a weekly average of 196,000 tons compared with 255,700 tons in the same month of the previous year. In February the weekly average was 206,300 tons against 247,200 tons a year earlier. Production in March was equivalent to an annual rate of 10,190,000 tons. Output of pig-iron also was at the lowest level recorded this year, at the annual rate in March of 6,400,000 tons, contrasting with 6,560,000 in February and 7,806,000 in January.

Seven Day Week

The seven-day week programme for continuous production in the Scottish iron and steel industry, agreed by employers and the Iron and Steel Trades Confederation, has started without hitch. The scheme was adopted at the Government's request to assist the " employment-for-all " policy and when in full swing should employ 3000 to 4000 additional workers and increase output of steel by several thousand tons a week.

The " non-stop " process has started in the melting furnaces, which, it is estimated, could produce 12,500 tons more in ingots. Supplies of fuel are now adequate, and when the melting furnaces have produced reasonable stock the seven-day week will be extended to other plants.

Production Cut.—More than 100 employees of the Etua Iron and Steel Works, Motherwell, have been suspended because of the fuel shortage and the plant is being operated on two shifts in 24 hours instead of three. Production will be cut by about 40 per cent

Next Week's Events

MONDAY, APRIL 21

Royal Statistical Society (Sheffield Group). The Royal Victoria Station Hotel, Sheffield, 6.30 p.m. Mr. M. Milbourn: " The Application of Statistical Techniques to Research and Testing."

TUESDAY, APRIL 22

Scottish Engineering Students' Association. 39 Elmbank Crescent, Glasgow, 7.15 p.m. " Engineering Quiz."

WEDNESDAY, APRIL 23

Society of Chemical Industry (Food Group). Burlington House, Piccadilly, W.1, 6.30 p.m. Annual general meeting followed by an address by Mr. T. Rendle: " Some Problems of Trade Effluent Disposal."

Textile Institute. Lord Mayor's Rooms, Leicester. Annual general meeting. In the afternoon—Sir Walter Norman Howarth: " The Chemistry of the Polysaccharides " (Mather Lecture).

FRIDAY, APRIL 25

Society of Chemical Industry (Manchester Section). Engineers' Club, Albert Square, Manchester, 5.45 p.m. Annual general meeting.

Society of Dyers and Colourists (Manchester Section). Lecture Theatre, Gas Department Showrooms, Manchester, 6.30 p.m. Dr. G. L. Roger: " Studies on Rayon Dyeing—Application of the Dyeometer."

Manchester Statistical Society (Industrial Group). 16 St. Mary's Parsonage, Manchester, 6.30 p.m. Mr. E. D. Van Rest: " Probability and the Engineer."

SATURDAY, APRIL 26

The Institution of Chemical Engineers (N. W. Branch). The College of Technology, Manchester, 3 p.m. Mr. S. Maddock: " Process Costing and Cost Control."

Ceiling Not Reached

Referring to prices of raw materials when he recently addressed paint merchants in London, Mr. W. J. Darby, managing director of Lewis Berger & Sons, Ltd., said he saw no signs yet of their reaching the top. A cross-section of raw materials used in the industry, taking January, 1945, as 100 per cent, showed, he said, increases from 20 to 335 per cent. A cross-section of the percentage rise of the finished products showed 67 per cent. Mr. Darby pointed out that shortage of linseed oil was not the only trouble for the paint industry—they were just as much troubled about other materials such as glycerine, synthetic resins, white pigments, gums, solvents, glues.

Corrosion of Buried Pipes

Wastage in Ferrous Metals

PROFESSOR R. P. LINSTEAD, F.R.S., speaking at Queen Mary College recently, said that the estimated loss from corrosion of buried cast-iron or steel pipes is £30,000,000 a year. "It has been estimated that 30,000,000 tons of ferrous metals are wasted by corrosion annually," he said. "Corrosion, whether atmospheric or immersed, is essentially a process of oxidation but it is a great deal more complicated than appears at first sight.

"It is now well established that the corrosion of a ferrous metal immersed in water occurs by an electrochemical mechanism. The surface of the metal is not uniform and when put in water some parts (the more active) become anodic with respect to others. A number of tiny galvanic cells are set up. If in a neutral solution oxygen is excluded, the hydrogen will collect on the cathode and will stifle further action. But if some agent, such as oxygen, is available to remove the cathodic hydrogen then corrosion will go on. Moreover, there are certain agents which can take the place of oxygen so that corrosion can, under suitable conditions, go on anaerobically. Such an agent is provided by the sulphate-reducing bacteria."

"An iron pipe buried in the subsoil under anaerobic conditions, for example in heavy clay, will corrode if there are present sulphate and the sulphate reducer, *Vibro desulphuricans*. The way in which the organism brings about the corrosion seems to be this. According to the general theory the iron will first undergo corrosion by the ordinary galvanic process:

$$Fe + 2H_2O = Fe^{++} + 2OH^- + 2H$$

the ferrous iron will dissolve at the anode and the hydrogen will be discharged at the cathode and will tend to prevent further action. The bacterial action involves the reduction of the surrounding sulphate to sulphide, the oxygen being used up in a chain of bacterial reaction terminating with the removal of the depolarising hydrogen

$$H_2SO_4 + 8H \longrightarrow H_2S + 4H_2O.$$

The corrosion reaction can now go forward again.

New Gas-Producing Plant.—One of the largest gas-producing plants to be erected in this country is that planned by United Kingdom Gas Corporation at a cost of £1,250,000 and having a capacity of 7,000,000 cu. ft. per day. The first unit, which will later be doubled, will carbonise 500 tons of coal per day and produce from it in addition to gas some 275 tons of solid smokeless fuel and 25 tons of tar. Official approval has been granted and the project, which will take four years to fulfil, is to be initiated at once.

Fuel Abstracts

Many Fields Covered

COMPRISING more than 500 abstracts monthly of world literature on all technical and scientific aspects of fuel and power, *Fuel Abstracts*, compiled by the Fuel Research Station of the Department of Scientific and Industrial Research and published each month by H.M. Stationery Office, London, W.C.2 (£2 10s. annually), is now available to all interested bodies or individuals.

Fuel Abstracts was first compiled in 1925, since when it has been issued free to an increasing number of research organisations. For various reasons it has hitherto been possible to meet only a small proportion of individual requests for copies from Britain and overseas. The annual subscription of £2 10s.—which meets only the cost of printing and postage—will now cover twelve monthly issues and two half-yearly indexes. Individual copies will not be for sale separately, and back numbers prior to January, 1947, are not available.

An extensive field is covered. Abstracts are classified in each monthly issue under the following headings: Natural solid fuels: winning; natural solid fuels: sources and properties; natural solid fuels: preparation; manufactured solid fuels; carbonisation; gasification; gaseous fuels; by-products of carbonisation and gasification; natural liquid fuels and lubricants; synthetic fuels, lubricants and other products; electricity and electric power; steam raising and steam engines; other prime movers; industrial furnaces, kilns, etc.; domestic heating, cooking, lighting, etc.; atmospheric pollution; refractories; fundamental science related to fuel technology; analysis, testing, instruments; miscellaneous.

During 1946 more than 6400 abstracts were provided. Each monthly issue includes a subject index, and every six months complete author and subject indexes are issued. The summary is printed on both sides of the paper.

I.T.O. Plans Criticised

Strong representations on a number of points at issue have been circulated by the World Trade Alliance Association to all the delegates of the Trade and Employment Conference, the preparatory committee of which is now sitting in Geneva. The Association urges in particular that formation of the International Trade Organisation should not be delayed by discussions on tariffs and preferences and that the latter are no serious impediment to world trade during the present world shortage while most governments accept the principle that exports must be covered by equivalent imports.

SAFETY FIRST

Security Measures in German Factories

by JOHN CREEVEY

IT is always useful to consider what others are doing in any field in which we ourselves are interested. In the matter of safety measures, the recent publication of a report on "Industrial Safety in Germany" presented by the Field Information Agency (Technical) of the U.S. Group Control Council (F.I.A.T. Final Report 801, Stationery Office; 13s. 6d.) merits attention.

The protection of the worker against industrial accidents and occupational diseases in Germany was provided for by State legislation under which the employers in groups of industries were organised into so-called "trade associations," each of which not only possessed a central office located at the principal site of the industry, but also a number of regional offices distributed throughout the rest of the country where the particular industry operated. These trade associations were charged with the major responsibility of reducing the accident toll, by issuing safety orders and safety instructions, reviewing of reports upon accidents, and approving of new safety equipment.

Government Approval

The need for responsible approval of safety equipment cannot be over-stressed. In Germany, this was a legal requirement, and only government-approved equipment was allowed to be used in industry. The approval system covered all such equipment as breathing devices (gas masks), protection against dust or paint spray, goggles, etc., explosion-proof lamps, guards against moving machinery, and fire-fighting equipment. Lists of approved equipment were published periodically, and the trade associations disseminated the information to their industries; it was there duty also to recommend and sometimes to enforce the use of the approved equipment.

Safety orders issued by the trade associations were drawn up by technical inspectors in co-operation with employers; whether or not the voice of the employees in these matters was also heard and considered is not clear, but we may infer that the employers contributed most of the data. In many cases the orders were based upon a study of accident statistics, the major object in view being to prevent the recurrence of particular accidents. Yet, irrespective of the actual mode of formulation, it is evident that these orders normally embodied a great amount of detail; those issued expressly for the chemical industry required some 240 pages of printed matter in form of a book with a page measuring 5 in. by 7 in., and the iron and steel industry demanded a similar book of 230 pages.

For recommending and enforcing safety measures, large plants were inspected six to eight times each year, smaller plants twice or three times, and the smallest concerns at least once every two years.

The employer was required to report every accidental injury or scheduled occupational disease on a prescribed printed form if injury or illness resulted in more than three days of lost time. That form went to the employer's trade association which first reviewed the facts in order to determine the conditions prevailing and, where necessary, sent technical accident-preventing personnel to inspect the plant, process, or situation.

Ample Publicity

"Safety First" publicity, as distinct from safety orders, was widely distributed. A large number of booklets were issued covering particular trades, distinct from the needs of the parent industry. These booklets described in detail just how the job concerned should be conducted with the greatest degree of safety and gave details of personal protective devices.

Paradoxically, despite all this intricate organisation, it seemed that the worker in the average small plant was permitted to carry on his work more or less as he pleased with regard to safety measures. He was provided with the necessary tools and safety devices, and it was in his hands whether he made use of them or not. If the worker did not use the safety devices provided, it was inferred that he took this course with full knowledge of the hazards involved. Compulsion only applied in cases where the risks involved damage to the plant or process.

Only at the large plants was there any attempt to employ a full-time safety officer. The small plants had a safety organisation consisting of committee men, who gave advice to employees in matters of safety, based on the safety publications. Plant of medium size fared rather better, for here safety was usually taken in hand (part time) by one of the maintenance engineers, under direct supervision of the plant manager. Personal safety of the individual, however, was little better than at plant of small size; the greatest part of all safety efforts was directed to the safeguarding of equipment,

rather than safety education for the actual worker.

Safety activities at large plant included committees for making safety suggestions, programmes of good housekeeping, promotion of personal cleanliness, contests for no-accident records, safety talks, and the showing of safety films. Some posters were also used, although safety publicity of this type was almost exclusively in the hands of a special organisation which served the national organisation of trade associations.

Amenity, as regards the individual worker, rarely seemed to exist, unless it was deemed advantageous to the employer or for general safety of the plant. Makeshift exhaust ventilation systems were often installed by the plants themselves; government regulations concerning ventilation needs were rarely as well defined as in other aspects of industrial safety.

Anti-Dust Device

Inspection of existing plant shows that some good practical results were achieved. In one installation of dust-collecting equipment, the filter bags were held under tension by helical springs, while a camshaft imparted a jerking motion and at the same time gave a lateral shake to the filter bag, as a stream of scavenging air cleaned the filters. To avoid the hazard of dangerous dust upon inaccessible machine parts, portable vacuum cleaners were equipped with a combined compressed air nozzle and suction nozzle; these blew out the dust and simultaneously removed it by suction.

Respiratory devices against noxious gases, vapours, dusts, fumes and smokes, were developed to a high degree, and they followed strictly military design or were at least influenced by such. This influence was especially evident in insertion type filters, which could be used with facepiece assemblies of the military type. There were, of course, exceptions to this rule, such as certain carbon monoxide masks and canisters to provide protection against the effects of exposure to tetra-ethyl lead. In these it was not possible to support the weight required for adequate protection by direct insertion in a facepiece, and the filters had to be carried on body harness, with a connecting hose.

Manufacturers of facepieces formerly considered leather to be the best material, although extensive use was made of rubberised cloth and moulded synthetic rubbers. The leather apparently gave the longest life, provided care was exercised in cleaning and oiling it, but the latest of the industrial type gas masks had a moulded synthetic rubber facepiece with seven points for the headband attachment and a rolled lip which gave a loose flap against the face for intimate seal. Eyepieces had a special lens inserted to prevent fogging; this lens was made of cellulose acetate, and the lens insert was cellulose nitrate with a gelatin coating.

Sterilising Cabinets

The sterilising of respiratory equipment was carried out to a high degree of efficiency, special disinfecting cabinets being provided with capacities up to 150 masks. Prepared ampoules of formalin were used in these cabinets, with ammonia ampoules for counteracting the formaldehyde at the end of the disinfecting operation. Recommended procedure was to vaporise the formalin by electrical heating for 10 minutes, and to allow fumigation to proceed for one hour. The formalin ampoule was then replaced by the ammonia ampoule, and the ammonia vapour was allowed to circulate for 15 to 20 minutes, and finally the cabinet was purged of all residual odour by drawing in outside air which simultaneously dried the mask.

Yet, while the development of respiratory protective equipment was worked out in detail, only limited attention was given to "head to toe" protection of the German workers, as in the provision of hats of hard leather, knee pads, shoes, gloves, goggles, and protective clothing generally. There were times, no doubt, when the worker lost confidence in his employer, and in the powerful "trade associations."

This personal protection of the individual is recognised as an important matter in Britain. Where an employer fails to take all reasonable steps to provide it, apart from what may be demanded by the law, the worker will have little confidence regarding all other safety measures—the use of which is enforced.

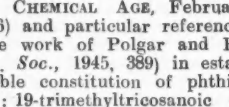
Widnes Industrial Exhibition

The exhibition of Widnes industries, held in the Widnes Technical College last week, dispelled the idea that Widnes is associated only with the manufacture of chemicals and copper. The exhibition was the culmination of the work of the first session of the Scientific Section of the Widnes Society of Art, supported with the exhibits of 25 of the leading local firms showing their processes and products. Several firms, who were quite willing to co-operate, were prevented by existing regulations which would not permit of advertising their wares. The Mayor, Alderman Richard Yates, who declared the exhibition open, said it illustrated in a remarkable degree the variety and scope of Widnes industries, practically all of which depended upon the application of science.

PROGRESS IN DRUGS AND FINE CHEMICALS—IV*

By G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

THE status of tuberculostatic substances was referred to in last year's Review (THE CHEMICAL AGE, February 16, 1946, p. 186) and particular reference was made to the work of Polgar and Robinson (*J. Chem. Soc.*, 1945, 389) in establishing the probable constitution of phthioic acid as 3 : 13 : 19-trimethyltricosanoic acid. This acid was believed to be the specific cellular substance responsible for the tubercle, the characteristic lesion of tuberculosis.

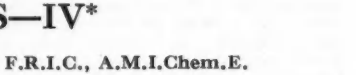


The work has been further reviewed by Robinson (*Nature*, 1946, *158*, 815) and the activity of other synthetic branched chain fatty acids is discussed. 3 : 12 : 15-trimethyldocosanoic acid is more active than phthioic acid in producing characteristic lesions when injected into the guinea-pig. Barry (*Nature*, 1946, *158*, 863), too, has reviewed the position of anti-tubercular compounds especially from the point of view of his own particular approach to the chemotherapy of this disease.

Potent Succinic Acids

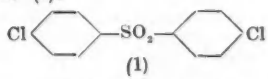
Barry reported in 1945 the bacteriostatic properties of the half-esters and half-amides of dialkyl succinic acids, α-methyl-α′-*n*-dodecyl succinic acid, which completely inhibited growth of the tubercle bacillus *in vitro* at a dilution of about 1/500,000. Barry and Twomey have since found that monoalkyl substituted succinic acids are equally as effective as the dialkyl series, and in both series the optimum length of the alkyl chain is 13 to 15 carbon atoms. In view of the limited success which has been achieved with diamino-diphenyl sulphone derivatives in guinea pigs infected experimentally with tuberculosis, Barry and Twomey synthesised a series of alkylthiomalic acids and alkane sulphonyl succinic acids. In the form of their half-esters these were found strongly to inhibit the growth of *Mycobacterium tuberculosis in vitro*.

In contrast with the alkylsuccinic acids no peak of activity was observed as the chain length of R increased from 11 to 18 carbon atoms.

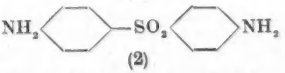


These compounds are antagonised by serum, but results of animal tests are not yet available.

Burger *et al.* (*J. Amer. Chem. Soc.*, 1946, *68*, 1725) report the first of a series of studies of antitubercular substances. These workers commence from the observation of Lauger, Martin and Muller (*Helv. Chim. Acta*, 1944, *27*, 892) that there is a structural analogy between bis-(4-chlorophenyl)-sulphone (1), a stomach insecticide, and the antitubercular drug, bis(4-aminophenyl)-sulphone (2).

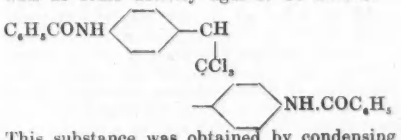


(1)



(2)

The insecticidal activity of (1) was increased by the introduction of a lipoid-solubilising trichloroethyl group which gave the insecticide DDT, which has already been discussed in this review. Burger and his co-workers substituted a similar group in (2) in the hope of securing a compound of increased antitubercular activity. It was not possible to prepare the simple DDT analogue with (2) because of its instability, but acyl derivatives were obtainable. The derivative 1 : 1 : 1 : - trichloro -2 : - bis(*p*-benzamidophenyl)ethane was found to have marked antitubercular activity *in vitro* as well as some activity against *S. aureus*.



This substance was obtained by condensing dibenzanilide with chloral at 28-29°C. in the presence of sulphuric acid.

Stages of Research

The chemotherapy of tuberculosis has been reviewed by D'Arcy Hart (*Brit. Med. J.*, 1946, 805) from the historical angle. He divides the past hundred years into four periods: (1) 1850-80—the pre-chemotherapeutic period during which advances fore-

* Parts I, II and III of this review appeared in our issues of January 11 (pp. 72–76), February 1 (pp. 184–191) and March 15 (pp. 311–317).

shadowed the coming of chemotherapeutic and antibiotic agents, and during which the morphology and therapy in relation to rest and diet as well as the earlier empirical treatments were examined. (2) 1880-1910—the tentative period of chemotherapy during which the tubercle bacillus (1882) and tuberculin (1890) were discovered and advancing knowledge of chemotherapy led only to disappointment in the treatment of this particular disease as well as the introduction of numerous "consumption cures" to confuse the issues in the public mind. (3) 1910-35—a period during which the chemotherapeutic approach was placed on a more rational basis with negative or inconclusive results, and a period which saw a dramatic rise and fall in favour of treatment of tuberculosis with gold preparations. (4) 1935-1946—the period in which sulphonamides were introduced into successful clinical use, and a period which saw the introduction of the antibiotics, of which streptomycin has proved to be the most important to date in this connection.

Inadequate Supplies

The tuberculostatic effect of streptomycin is undergoing careful assessment and reports are rightly guarded in tone. The investigations regarding its use in tuberculosis are restricted in extent on account of the low supply to date of the antibiotic in the U.S.A. A summary of observations in one hundred cases has been published by Feldman *et al.* (*J. Amer. Med., Ass.*, 1946, *132*, 778). The exploration followed the finding that when mice or guinea-pigs are infected with lethal doses of tubercle bacilli the disease may be brought to a state of arrest by streptomycin.

The authors find that the results obtained with these patients are definitely and consistently encouraging and that more extensive trials are warranted. They find that the manifestations in man may be suppressed with at least temporary retardation of the pathologic processes. Streptomycin seems to suppress the disease rather than eradicate it in the concentrations which could be achieved in the tissues. It was found necessary to administer large doses amounting to from 1 to 3 grams per 24 hours divided into four to six doses by deep subcutaneous or intramuscular injection. This daily amount must be administered over at least from two to four months requiring up to 360 grams in all so that the treatment is very gruelling for the patient. A pertinent point in the difficult supply position is that the authors recommend that treatment should not be undertaken unless adequate amounts of the antibiotic are first available.

An official statement has been issued regarding streptomycin by the U.S.A. National Research Council (*J. Amer. Med. Ass.*, 1946, *131*, 31). This emphasises that a programme of clinical investigation is to be carried out, to be directed in the main to disease resulting from infection by the susceptible gram-negative bacilli; and in particular investigations are being carried out in the treatment of typhoid, tularemia, salmonella infections, influenza infections, etc. Indeed, Durant *et al.* have already reported (*J. Amer. Med. Ass.*, 1946, *131*, 194) marked success in the treatment of pulmonary infections due to *Haemophilus influenzae* with streptomycin. A general review of the use of streptomycin in infections has been issued by the Committee on Chemotherapeutic and Other Agents, the appropriate committee of the U.S.A. National Research Council. The review deals with the reports of 55 investigators of 1000 cases mainly subject to infections not susceptible to penicillin or the sulphonamides.

The programme envisaged has been interrupted to conserve the limited amount of streptomycin available for the treatment of tuberculosis. The requirements of the Food and Drug Administration of the U.S.A. Federal Security Agent have been established as at July 15, 1946, as follows: (1) Minimum potency not less than the equivalent of 300 micrograms streptomycin base per mgm. of dry powder (the potency of crystalline streptomycin base has been established at 1000 units per milligram); (2) the preparation is sterile; (3) non-pyrogenic; (4) non-toxic; (5) moisture is not more than 3 per cent.; (6) the preparation should cause no greater fall in blood-pressure when injected into cats intravenously on the basis of 300 micrograms per kilo of bodyweight than the equivalent fall with 0.1 microgram per kilo of bodyweight for histamine base; (7) streptothricin is absent; (8) a substantially clear solution is given with *p*H 5.0-7.0 when the powder is mixed with sterile distilled water in the concentration of 50,000 micrograms per c.c.; (9) expiry date is 18 months after the batch was manufactured (refrigeration is required).

Other Uses

Streptomycin has been administered orally, parenterally and by nebullisation. Very little is absorbed from or destroyed in the gastro-intestinal tract and hence a high concentration can be maintained therein to give a bacteriostatic effect. Very little of the antibiotic is found in the blood following oral administration or inhalation. After injection 60-80 per cent of the drug is found in the urine within 24 hours, and it is thus useful in treatment of susceptible infections of the genito-urinary tract. Generally streptomycin was found effective in the treatment of tularemia, *H. influenzae* infections, gram-negative infections of

the genito-urinary tract; bacteremia and meningitis due to gram-negative organisms. The treatment of typhoid, brucellosis and *Salmonella* infections proved inconclusive and disappointing. Infections due to a number of other organisms require further study.

Nicholls and Herrell (*J. Amer. Med. Ass.*, 1946, *132*, 200) have observed that susceptible organisms sometimes develop resistance to streptomycin with incredible rapidity. Miller and Bohnhoff (*J. Amer. Med. Ass.*, 1946, *130*, 486) have found that appreciable resistance to streptomycin may be induced in gonococci and meningococci, but the organisms remained susceptible to penicillin both *in vitro* and *in vivo*. Similarly, penicillin resistant strains remained susceptible to streptomycin. Organisms developing resistance did not show the gross and microscopic abnormalities of the penicillin resistant strains and the authors conclude, therefore, that the mode of action of streptomycin on these organisms differs from that of penicillin. Finland *et al.* (*J. Amer. Med. Ass.*, 1946, *132*, 17) confirm that the problem of acquired resistance is of greater difficulty with streptomycin than with penicillin. They found that resistance was induced *in vivo* in twelve cases of genito-urinary tract infection. As to the mode of action, already remarked upon above, Bondi *et al.* (*Science*, 1946, *103*, 399) bring evidence to bear that the activity of streptomycin is due to its ability to block some enzyme system, oxidative in nature, which is essential only to the growth of susceptible aerobic organisms.

Study of Toxicity

Samples of streptomycin produced to date seem to have shown considerable variability in toxicity and in a histamine-like action, and the limits of these effects as prescribed by the Food and Drugs Administration have been mentioned. Two fatalities from the histamine-like agent have already been reported. Toxicity seems to vary from batch to batch and seems to be due to an accompanying impurity. Hottig *et al.* (*Science*, 1946, *103*, 355) have examined the effect of streptomycin on the renal, hepatic and haematological functions and find no serious organic toxicity in man although there are side-reactions.

Brownlee *et al.* (*Lancet*, 1947, *252*, 9) have examined the clinical and pharmacological aspects of the toxicity of streptomycin. The evidence is presented that streptomycin concentrates, though of high purity, are persistently contaminated with histamine-like substances which requires that the drug be subjected to biological control. The authors have examined 17 batches of streptomycin from a single British source, both pharmacologically and clinically, in fourteen tuberculosis cases. The relationship between potency (in terms of weight of pure base—C_{21} H_{37} N_7 O_{12}—M.W. 579) and toxicity was compared with published data for batches of American origin. None of the side-effects described by Hettig (v. supra) such as facial flushing, headache or histamine-like action was observed when samples from the 17 batches were examined clinically. The authors conclude that streptomycin of the purity of the British batches can be administered safely at the high dose levels which it has already been indicated are necessary for the control of tuberculosis *in vivo*. Differences in toxicity, it is pointed out, are to be expected from concentrates of antibiotics of natural origin and are inherent in the method of preparation which offers many variables.

Consistent Data

An interesting feature of the work of Brownlee and his colleagues is that when the relationship between potency and toxicity (L.D.50) is plotted the results for each of their 17 batches falls on two smooth curves. Six fall on a curve with point of origin at the L.D.50 for pure streptomycin —220 mg. per kg. Eleven batches may be considered to fall on a smooth curve with a point of origin corresponding with L.D.50, 100 mg. per kg., and hence the batches in this group may be considered to be a mixture of streptomycin of L.D.50, 220 mg. per kg. with a compound of L.D.50 greater than 100 mg. per kg. Alternatively, the batches may be considered to be impure concentrates of a second pure streptomycin having a L.D.50 of some 100 mg. per kg.

Since the work of Brownlee *et al.* was completed the National Research Council (U.S.A.) have reported that some skin eruptions and fevers and neurological disturbances such as vertigo, tinnitis, deafness and paresthesia are due to the pure substance and not to impurities and that these side-effects increase in frequency with increased dosage (*J. Amer. Med. Ass.*, 1946, *132*, 70). Among patients receiving 3 grams per day 46 per cent showed reactions and when the dose was 4 grams or more 60 per cent had reactions. With an average dose of 1 to 2 grams per diem for 90 days Brownlee *et al.* found none of these side-reactions.

Much work is being devoted to the elucidation of the structure of streptomycin in U.S.A. and Brink *et al.* (*Science*, 1945, *102*, 506) isolated a crystalline base by acid hydrolysis of streptomycin. The structure of this hydrolysis product, streptidine, has been considered by Fried *et al.* (*J. Biol. Chem.*, 1946, *162*, 391) who find it to be optically inactive, devoid of carbonyl groups, and to be the moiety responsible for the Sakaguchi reaction given by strep-

tomycin. Two guanidino groups are present. Among structural formulae consistent with the results obtained by these authors is a tetrahydroxyguanidinocyclohexane structure suggestive of a biogenetic relationship with inositol.

Just as most of the earliest work on penicillin was done in Britain so most of the early work on streptomycin has been carried out in U.S.A. Indeed, knowledge of the drug in this country is almost entirely derived from U.S.A. published results.

Production Methods

A number of accounts of the methods of production are coming to hand. In one statement, Merck & Co. are reported to have established a production unit for 100,000 grams per month at a cost of about £900,000. The method of fermentation using the organism *Streptomyces griseus* makes use of the deep-fermentation or submerged mycelium technique developed in connection with large-scale penicillin production. The organism is innoculated into a sterile wort of glucose/peptone/meat extract/common salt and gradually built up by sequential transference into increasing volumes of wort in a series of four aerated carbon-steel fermenters.

After filtering off the mycelium, the streptomycin is absorbed on carbon, impurities are washed out with alcohol and the streptomycin elutriated in a two-stage countercurrent process utilising acidified alcohol. The acid eluate is concentrated and dehydrated in a series of three single-pass vacuum evaporators. The concentrate contains 25 per cent total solids of which about 25 per cent is streptomycin. Particulars of the refining of this crude material are vague, but it is possible that precipitation in selective solvents is one of the operations involved. The purified material is finally dehydrated by what is now a normal freeze-evaporation process.

A method of preparation is also described by LePage and Campbell (*J. Biol. Chem.*, 1946, *162*, 163) using a medium consisting of 1 per cent glucose, 1 per cent yeast-extract, 0.5 per cent sodium chloride, 0.001 per cent ferrous sulphate and 0.025 per cent. magnesium sulphate at *p*H 6.8. The use of beef extract peptone instead of yeast extract was found to give a product which was coloured and highly hygroscopic.

In this case surface mycelium fermentations were carried out in glassware with priming giving titres of 250-400 streptomycin units per ml. The filtered fermentation liquor is stirred with decolorising carbon at *p*H 8.0 filtered, and washed with water. The carbon is suspended in acidified methanol, the methanol is filtered, adjusted to *p*H 6.0 and concentrated *in vacuo* to 10 per cent of the original volume. The active material is then precipitated with seven volumes of acetone to give a crude containing 30-80 units per mg. The process is repeated with slight modifications to give a white almost non-hygroscopic powder. A total recovery of 32.9 per cent of the streptomycin in the original filtrate is reported of which 22.2 per cent represents high potency material and 10.7 per cent low potency material. This latter may be further processed and 90 per cent of it recovered.

Interestingly, the histamine-like factor which contaminated earlier preparations was found by Le Page and Campbell to be absent. The medium used by these workers has the disadvantage of costing 50 per cent more than that using peptone-beef extract; however, this fact, it is claimed, gives more rapid production and greater ease of purification. Raghunandana Rao *et al.* (*Nature*, 1946, *158*, 23) find an enzymic hydrolysate of groundnut cake a suitable ingredient of the medium in the place of meat or yeast extract.

The fact that, hitherto, supplies of streptomycin produced in U.S.A. have been insufficient to meet clinical requirements there, quite apart from export needs, has prompted the establishment of pilot plants in Britain, and it is reported that Messrs. Boots, Glaxo Laboratories, Distillers, Co., Ltd., Heyden Chemical Co., and (by implication from the work of Brownlee discussed above), the Wellcome Foundation, Ltd., are concerned with production in this country. Drummond (*Pharm. J.*, October 5, 1946, 209) has stated that Messrs. Boots' existing pilot plant was producing 2-3 grams per day, barely enough for the treatment of one tubercular patient; but it was expected that by November 2 kilos per month would be available. Drummond has also stated that the U.S.A. output was 75 lb. per month, roughly equivalent to the reported output of 35 kg. per month in May, 1946. The Distillers Co. plant at Speke was expected to be producing about 5 kilos per month.

Dearer than Penicillin

It seems likely that the cost of streptomycin will always exceed that of penicillin. It is consdered that the ruling cost of $15 a gram is not likely to be reduced beyond $5 a gram. At this last cost, the 360 grams required for a three months treatment of tuberculosis would cost $1800 (say £450: but this is regarded as being not significant against the cost of sanatorium treatment and the subsidising of patients and their dependents (*Brit. Med. J.*, 1946, No. 4473, 466).

Abraham and Duthie (*Lancet*, March 30, 1946, 455) have considered the effect of *p*H of the medium on the activity of streptomycin, penicillin and other chemotherapeutic agents. They observe that an increase in the acidity of the medium decreases the

antibacterial activity of the basic substances such as penicillin, mycophenolic acid and helvolic acid. They suggest that the most likely explanation of this phenomenon is that the basic drugs compete with hydrogen ions and the acidic drugs with hydroxyl ions on the appropriate point of the cell surface.

A tenfold difference between the activities of the two basic antibiotics is found at *p*H 6.0 and *p*H 8.0. It is conceivable that at threshold concentrations of bactericidal activity the *p*H of the medium may be a critical and deciding factor in determining the fate of the cell and this feature alone may account for anomalies observed in determining the bactericidal concentrations of penicillin, etc.

This effect—the increase in bactericidal activity as the *p*H is raised—is shown by the basic anti-bacterials, the acridine derivatives, mepacrine, propamidine and cationic detergents. The clinical implications may be serious when the physician is handicapped by decrease in activity of the basic drug and by anomalous results obtained with streptomycin. The fact that in some cases lethal doses have failed to control the infection may be explicable on the basis of those findings.

The implications are wide, as other basic chemotherapeutic agents (for example arsenicals or alkaloids) may suffer from the same disability, and this may account for the comparative failure of these drugs in the treatment of more chronic forms of infection as compared with success achieved in the more acute types. By contrast the acid drugs do not suffer by an increase in acidity of the medium and are, indeed, enhanced in their activity by such a change.

(To be continued)

German Carbide

War Production Increased

THE outstanding feature in the development of the German carbide and cyanamide industry since 1908 (when the first industrial plants were established) is the great increase in the size of carbide furnaces as well as in the total production of carbide. This is one of the noteworthy facts revealed by the Allied industrial intelligence reports (C.I.O.S., Item 2, File XXVII—92; 5s.). The increased production has been brought about by the discovery of processes by which acetylene may be synthesised into a large number of organic compounds, some of which are of great importance in the rubber industry, the manufacture of plastics and resins, etc.

Among large-scale factories built shortly before or during the war, reference is made to the Schkopau plant, which had an annual production of 298,256 metric tons in 1943 and to that at Mueckenberg, with an output, in the same year, of 99,015 tons. It is reported that attempts have been made to construct carbide furnaces of up to 40,000 kW capacity, but that results have indicated that the most economical and convenient units should not exceed 25,000 kW.

In the German furnaces, no radical departure from the standard practice had been observed. However, some details, to which attention has been drawn in the report, merit attention. The special method of cooling the carbide, as practised at Ludwigshafen, would appear to be advantageous.

The report contains also details about the Miguet system of furnace construction, based both on an interview with the inventor, M. Miguet, and on a visit to the plant at Porto-Marghera, near Venice.

Hydrogenation Plant

Underground Factories

ACTIVE steps had been taken in Germany as early as 1936 to establish at least one large-scale hydrogenation plant underground. This is revealed in an Allied intelligence review (C.I.O.S., Item 30) of what had been done at Nidersachswerften, which representatives of the Ministry of Fuel and of the U.S.A. Bureau of Mines have visited.

The plant was installed at the anhydrite workings of the I.G. and it was thus possible to remove all excavation and other materials from the site without showing any sign of an abnormal activity. In 1936 the staff received instructions to change from face working, to underground mining, consisting chiefly in the driving of a large tunnel. In 1944, instructions were received to make further excavations for two plants, Kukuck I, a hydrogenation plant, and Eber, a liquid oxygen plant. The latter was 80 per cent completed and was to be run by the firm of Junkers.

By March, 1945, working strength had reached 1600, including skilled workers from the Ruhr, Saar and Aachen mining regions as well as unskilled foreign slave labour. The largest cavern was to be 47 ft. wide and 37 ft. high. Little mechanical erection work had taken place, except that of an air compressor.

Metal Company Fire.—The N.F.S. were called early on April 10 after smoke had been seen issuing from the premises of the War Lane Metal Company, New Street, Aston, Birmingham. It was found that about five tons of brass swarf, stacked in bags in the melting shop, were burning. The outbreak was soon extinguished without damage to the works.

More Uses for Bauxite

Effective Absorbent, Filter and Catalyst

FURTHER widened demand for bauxite as an important aid to many chemical and industrial processes is foreshadowed by recent discoveries of the mineral's exceptional properties as an absorbent or adsorbent and as a catalyst.

Some of the industrially important characteristics of bauxite, apart from aluminium production, has lately been recorded by the American Cyanamid Company, which emphasises in particular its special usefulness in replacing other clay substances in filtering and absorption. The report notes that "Fullers' earth" (activated clay) has long been used in many trades; when oils are filtered through it, it takes up impurities and is subsequently reactivated for repeated use by heating in a current of dry gas. Activated alumina is a by-product of aluminium manufacture and, being a manufactured product, is somewhat freer of earthy contamination than activated clays, a fact which is important to some users. Silica gel is sand fused with soda ash, dissolved in water and precipitated out with an acid, providing useful, pure, hard, porous granules for such use.

Immense Porosity

The newcomer among these thirsty minerals is bauxite. It has unique physical characteristics of interest to many industries. As a clean, natural mineral it presents sponge-like particles of immense porous complexity, with correspondingly great surface area; the granules scooped into two hands may have a total surface of 20 acres. The material can be selected and treated by appropriate controls of calcination temperature and by other processing innovations to provide a variety of grades, each activated for specific industrial uses where maximum surface contact with oils or gases is desired.

Activated bauxite was first offered to petroleum refiners in 1936 as an adsorbent for purifying lubricating oil, and its value for the purpose is firmly established now. The oils come through the bauxite beds brightened in colour, freer of carbon, improved in viscosity and more resistant to oxidation. Mineral waxes and petrolatums are also thus improved to meet the rigorous limitations of taste, odour and colour specified for them when used by the food, drug and cosmetic industries. Activated bauxite adsorbs impurities from sugar liquors and syrups.

Bauxite's capillary structure gives it, when correctly activated, an intense thirst to slake, so industry is putting it to work as a dessicant. It is now drying hydro-carbon gases and liquids, many liquid organic chemicals, and hydrogen, hydrogen sulphide and compressed air.

Bauxite is doing yeoman duty as a catalyst. It resists "poisoning," lengthens cycle time and gives long service in the catalytic cracking of gas, oils and naphthas. As a process absorbent, bauxite is used in petroleum refining in "guard sections" where corrosive fluorides or aluminium chloride, necessarily present in certain reaction steps, are prevented from passing on to other points in the cycle where they would be damaging. Its field of application in dehydrogenation and dehydration reactions is wide and becoming wider.

The great surface area of bauxite particles makes them effective as a support for catalysts—zinc chloride or nickel, molybdenum, chromium or their oxides; these catalysts are deposited as thin coatings on the bauxite grains and thereby provide extended areas of contact with the chemicals under treatment.

Bauxite—concludes the Cyanamid report—is chemically inert to most exposures and is readily reactivated or reconditioned for repeated use. Its availability in abundance and the development of the art of activating and reactivating it suitably for absorbent, adsorbent and catalytic uses come at a time when more precise conditioning of materials is demanded by the exacting techniques which characterise modern manufacturing

Columbium Nitride as Radio Detector

THE discovery that superconducting columbium nitride, at −345° F., will act as a detector for radio waves has been made by the Department of Chemistry at the John Hopkins University in the United States. The discovery was made accidentally during research on the infra-red ray bolometer when, as a battery was running low, the heating coil was turned off which governs the highly sensitive point at which the columbium nitride strip in the bolometer is made sensitive to infra-red rays. When the temperature fell to −345° F. because of the liquid hydrogen encasing the bolometer, a loudspeaker, used to observe audible effects, issued a local broadcast programme. Investigation showed that through the medium of superconductivity, columbium nitride was acting as a radio detector. Its discovery was due to the fact that it was connected to a standard audio-frequency amplifier. Depending on super conductivity, this is a new principle of radio reception which, it is forecast, may influence trans-ocean and other long distance radio communication.

A CHEMIST'S BOOKSHELF

Practical Plastics. Edited by Paul I. Smith. London 1947: Odhams Press Limited. 320 pp. Price 10s. 6d.

This book is a clear and comprehensive guide to the principles and practice of modern plastics and a very welcome addition to the vast and ever growing literature on plastics. It is written not only for the general reader but also for the specialist in the subject. Thirteen well known experts in this field contribute to the rich contents, which are divided into 23 chapters. Numerous firms have lent their assistance by supplying detailed information and illustrations, of which nearly 250 are contained in the book, including photographs, full-page artist's impressions of factories and processes and step-by-step drawings of machines and tools. From the chemistry underlying the production of the basic raw materials to the moulding and fabrication of simple and complex products, the subject is treated in a practical and objective manner and even the student will have no difficulty in gaining a clear insight into every aspect of the manufacture of plastics and their important effect upon our daily life. An appended glossary of terms used in plastics and a detailed index will be of great help to the reader of this commendable publication.

F. Neurath.

American Fabrics. Z. Bendure and G. Pfeiffer. The Macmillan Co., New York (Macmillan and Co., Ltd., London). 688 pp. £2 10s.

To review the vast and complicated structure on which the textile manufacturing industry is based to-day is a task for the stouthearted. That, nevertheless, is what two American women, Miss Zelma Bendure, a merchandising specialist, and Mrs. Gladys Pfeiffer, a housewife, who has studied textiles from the consumer's standpoint with phenomenal concentration, set out to do. The results of their enterprise are represented by "America's Fabrics," which will long stand as the most comprehensive summary yet attempted of modern textiles and the technical background from which they emerge. A characteristic example of the thoroughness with which they have tackled their subject is the 32 pp. devoted purely to chemistry and the structure and properties of the chemicals which to-day play so decisive a part in the production and decoration of all fabrics and the creation of new ones, such as nylon. Whether the average user of fabrics, merchant or manufacturer, would be any the worse equipped for not having studied the authors' summary of, for instance, Dalton's Atomic Theory, the elements and 50 other basic principles of chemistry is, however, open to doubt. This section would have been more acceptable, even to the chemist, if it shared the characteristic which distinguish the rest of the book, especially from the "austerity" volumes with which we have to be content—the highly decorative or informative illustrations reproduced on almost every page.

Electronic Theory and Chemical Reactions. R. W. Stott. Second Edition. Pp. 112 and vii. Longmans, London. 6s.

It was Lord Kelvin's contention that for a quantity (in physics) to be understood it should be measurable. It is equally true to say that before a chemical reaction can be understood the mechanism by which it is brought about must be appreciated. In order to test theories of chemical reactions many experiments have to be planned and carried out. Sometimes the fundamental importance of these experiments is so masked by a mass of experimental detail that their full significance is only apparent to a limited number of workers specialising in this field. This difficulty has been partly overcome in recent years by the publication both in this country and abroad of several textbooks giving the fundamental theory of certain well-established reactions. Unfortunately the majority of these books demand a high standard of academic knowledge and it is therefore good news that a second edition of Mr. Scott's book has appeared, catering as it does for less advanced readers.

In this book the author conveys an excellent impression of the mechanism of several types of chemical reaction. Much of the book deals with the application of the electronic theory of valency and since the experimental evidence in support of this theory has been derived from a study of organic reactions it is not surprising to find that of the six chapters only one is devoted to inorganic compounds. The main points

which are dealt with in this chapter are ionisation of acids, hydrolysis and the hydrogen bond. This leads naturally to a consideration of organic acids and other cases of reactive hydrogen atoms. There then follows a most lucid account of the steps involved in certain types of organic reactions. The reactions which are considered are those of addition, substitution, hydrolysis and the attack of nucleophilic and electrophilic reagents. Before considering reactions involving the benzene nucleus, most of the important evidence which throws light on the structure of benzene is discussed, while the following chapter deals with nuclear substitution. Here the author provides an extremely clear picture of the process of aromatic reactions and explains such points as the acidity of the phenols and the reason for substituents being o, p directing or m directing. The book concludes with a short chapter on the uses of radio-active and other isotopes in elucidating reaction mechanisms.

The treatment throughout is only of an elementary nature but this in no way detracts from the clearness of the explanations put forward. There is however one point which should be guarded against, namely, that over simplication tends to lead to untruths. Two instances of this may be quoted. Evidence is provided for the fact that hydrogen chloride is a covalent compound whereas in solution it is ionised, from which it is inferred that no pure acid is ionised. Again, one of the uses of radioactive isotopes is shown to be the proof of the course of the Cannizzaro reaction although the mechanism which is "proved" involves no alkali.

Apart from one or two points of this nature Mr. Stott provides a remarkably clear and interesting picture of the mechanism of chemical reactions and, as only a knowledge of chemistry to Higher Certificate standard is assumed, this book is eminently suitable for first year university students. Presenting as it does the results of recent work in a compact and readable form it will also be found highly suitable for those chemists who have been unable to keep in touch with the literature. For those who require further information a list of references is quoted at the end of each chapter.

GUY G. S. DUTTON.

Institute of Chemistry

Increased Activities in 1946

A STEADY widening of the activities of the Royal Institute of Chemistry and the resumption of some interrupted by the war is evidenced in the 1946 annual report which appears in the Institute's *Journal and Proceedings* for April. The Nominations, Examinations, and Institutions Committee in particular was kept fully occupied during the year, although the number of candidates (1471) did not reach the peak figure recorded in the previous year. Candidates for associateships in general chemistry numbered 182, of whom 90 passed; there were 37 candidates for fellowships in seven departments of chemistry and 24 of these were successful. The committee amended the regulations for admission of associates to provide that a degree with first or second class honours in Chemical Engineering will exempt candidates from the associateship examination.

Professional Status

Professional status and conditions of employment have again been closely studied in many directions and the two committees formerly responsible have been merged as the Appointments and Economic Status Committee. Several aspects of Government employment of chemists have been the subjects of representations by the Institute to Ministers concerned and the conditions of appointments, such as those of public analysts, have been discussed with the Association of Municipal Corporations and the Society of Public Analysts.

Resulting from earlier discussions with the Ministry of Education, the scheme for the award of National Certificates in Chemistry has been amended to provide facilities for two types of certificate, one in chemistry, the other in applied chemistry. During the year, the programme of courses—post graduate, refresher courses and others—organised by the Institute has had an enthusiastic reception and the attendance of members and visitors has occasionally been larger than the accommodation.

The increased expenditure by the Benevolent Fund Committee during the year of £2136 (compared with £1515), which is attributed to a large extent to the increased cost of living. Receipts from members, excluding bequests, amounted to £2217, against £2147 the previous year. The general income and expenditure account of the Institute in 1946 showed a credit balance of £2085, of which £1000 is being devoted to the intermittent publications reserve fund and £1000 to the superannuation reserve.

PAINTS FROM WOOL GREASE

SOME MODERN FORMULATIONS

NUMEROUS attempts have been made over a period of years to use wool fat in the paint industry, chiefly by treating the fat with air agitation and incorporating basic substances at elevated temperatures. These added materials included, zinc oxide, calcium hydroxide and rosin. In the fabrication of paint driers wool grease, fatty acids have been utilised, by heating the acids with acetates of lead, zinc, manganese or cobalt. Such innovations have not, however, provided a large-scale outlet for wool grease. For some years the Bradford Corporation has been experimenting with the use of recovered wool grease products in the manufacture of paints and both oil-bound water paints and oil paint have been made from these products. The two main ingredients of the wool grease are Crujol, which is a soda soap made from crude wool grease; and Varwolax, a drying oil extracted from wool grease.

Crujol: This is a dark brown plastic soap prepared direct from recovered wool grease in thin sheet form which is packed as a crinkled mass. Its total fat content is around 90 per cent and it contains traces only of alkali and water. When mixed with water it forms a stable cloudy emulsion and tends to form gels on cooling. It has a melting point of about 400°F. A typical analysis is as follows:

Moisture	0.6%	
Free caustic soda	0.4%	
Combined fatty anhydrides	57.2	66% soda soap
Combined soda oxide ...	8.8	
Unsaponifiable oil	33.0%	

Varwolax: This is a brown, very viscous oil, possessing drying properties and exceptional resistance to alkali because of its non-saponifying constitution, since it is derived chiefly from the unsaponifiable part of wool fat. The caustic alkali treatment, to which this unsaponifiable matter is subjected during process, brings about the development of slow drying properties which may be accelerated by the addition of driers, such as cobalt naphthenate, enabling it to harden to a glossy varnish-like surface. A typical analysis of Varwolax is as follows:

Unsaponifiable matter ...	96%	
Saponifiable matter ...	(nearly) 4%	
Ash	trace	
Moisture	trace	
Iodine value	110%	
Acetyl value	60%	

Varwolax has a specific gravity of 0.943 at 60°F., is soluble in most solvents, but only partially soluble in alcohol, and may be readily blended with all drying oils, when it assists in resisting alkali attack due to its large unsaponifiable content. It possesses the property of solubilising to a fluid condition solutions of certain metallic soaps in solvents which would otherwise be solid gels when cold. On addition to soap solution it readily emulsifies and forms an oil base for oil-bound water paints.

Very extensive use has been made of the above two wool grease derivatives for camouflage paints during the recent war and now their use has been extended to paints for household and commercial work. The use of Varwolax has conserved appreciable quantities of linseed oil, apart from the fact that it is, in general, more satisfactory for application to an alkali plaster surface than normal oil-bound paints. As is well known, the latter react with the lime, or other alkali, in new plaster, cement or asbestos, causing breakdown of the film after a short period; whereas the wool fat derivative, being unsaponifiable, does not react with alkali and so the paint film remains unbroken for long periods.

Water Paints

Since Crujol is a soap, when making water paints containing this substance it is not possible to use basic pigments or anything which reacts with a soap solution to precipitate out metallic soaps. Precipitated chalk or whiting may be used, provided it contains no reactive water solubles. For the same reason it is not possible to apply such water paints to a white surface, since lime or its soluble salts invariably upset the soap emulsion very quickly, resulting in the breakdown of the water paint. However, on all other alkaline surfaces, where the water paint may be applied in a smooth film, the paint will not break down afterwards. These products from wool fat are immune from mould growths so that they have good keeping properties. Water paint incorporating Crujol/Varwolax is resistant to water washing after it has thoroughly dried; in fact, when applied to a porous surface and beginning to dry, it cannot be washed off with cold water even so little as an hour or so afterwards.

Harder and whiter paint films, which are extremely water-resistant and washable, can be produced by the incorporation in the Varwolax of a proportion of paraffin wax, say 1½ parts paraffin wax melted into 2 parts of Varwolax, which is then emulsified with 1 part of Crujol in the usual way. This "oil" bound water paint tends to solidify on keeping, but actually possesses a remarkable thixotropic property, since on the addition of a very little ammonia and stirring, a free-flowing paint is again produced.

As an example of normal formulations, it

is found that the cost of raw materials used in making the binder is about £25 per ton, or about £35 per ton for the finished water paint. Thus there is a good margin of profit where these paints are sold at £60 to £70 per ton. Some of the various formulations are as follows:

Crujol/Varwolax Formulation: Soak 1 part by weight of Crujol in 4 parts cold water for 24 hours. Then add 3 parts boiling water and stir, when the Crujol will dissolve readily. A simple iron tank with stirring gear is the most suitable vessel for the purpose, no high speed is required. When the soap is in solution add 2 parts of warm liquid Varwolax, when a stable emulsion is readily formed by stirring to produce the binder, or paint medium.

To prepare the water paint, mix 25 parts lithopone with the 10 parts binder, prepared as above, and stirring constantly, breaking down the lumps as far as possible, and allow to stand overnight. It will then be found that further stirring of the cooled mixture produces a smooth paste. It may be tinted to any desired colour shade by addition of appropriate dyestuff. Although a pure white is not produced with lithopone alone, addition of 0.1 per cent ultramarine is sufficient to overcome the slight yellowish tint to result in a slightly off-white colour. Lithopone is not essential to the mixture. Titanium oxide can be used with the most satisfactory results. Well washed precipitated chalk produces a light biscuit-coloured paint. Basic pigments, such as zinc oxide and certain organic dyes, such as those based on calcium sulphate, cannot be used as they react with the soap and form a sponge mass.

Paints formulated as above form a paste when cold. They should be run into containers while still warm, passing through a fine gauze to hold back any lumps of soap or pigment which may have escaped dispersion. In practice, 100 parts of water paint paste can be thinned with 20 to 25 parts of water to produce smooth flowing "ready for use" paint. In use, the addition of a little ammonia is an aid to easy brushing out. Second coat work can be easily carried out the following day without fear of "working up." This material has an advantage on new plaster, since it is not affected by lime or alkalis, and its penetrating effect acts partly as a sealer, thus it is satisfactory on damp walls.

Oil Paints

Oil paints suitable for both interior and exterior work have been produced from these derivatives. Varwolax and Crujol are used together to make a new material to which the name Lanalose has been given and it is Lanalose which is used as an ingredient of oil paint. Lanalose is a dark, soft thermoplastic resin, possessing drying, or hardening, properties, owing to its high content of Varwolax unsaponifiable drying oil. It is manufactured from a water emulsion of Varwolax added to Crujol solution, such that the amount of Varwolax present slightly exceeds the amount of soda soap. The whole is thrown out of the water by the addition of magnesium salts, whereby magnesium takes the place of soda. The final product, after washing and drying by fusion, becoming Lanalose. A typical formulation incorporating Lanalose is as follows:

Lanalose Formulation: The following formulation is suitable as a good general purpose paint.

Ester gum or synthetic resin	5 parts
Lanalose	5 ,,
Thinners (white spirit) about	7 ,,
or	
Zinc resinate (synthetic resin)	5 ,,
Lanalose	12 ,,
Thinners	13 ,,

Run the Lanalose by heating at not too high a temperature, preferably by placing in a steam-jacketed vessel and allowing to melt overnight, and dissolve in two-thirds of its weight of thinners by gradual addition with stirring, which will produce a 60 per cent solution. The ester gum, or synthetic resin, is dissolved separately in a similar manner (usually by fusion, followed by cutting with spirit) in the remainder of the thinners. When in a cool condition the two solutions are mixed. This constituting the medium, which should be quite fluid when cold. Owing to the high proportion of Lanalose, wetting properties are good, and milling in a ball mill with most pigments gives a very satisfactory smooth paint. Where a paint of fairly good gloss is required, addition of about 25 per cent of pigment is sufficient to give a varnish type of paint. For a general purpose paint, an average addition of about 40 per cent of pigment will produce moderate gloss with sufficient plasticity and stability for good weathering properties. The resin or gum used in the above formulation must be low in acidity to obviate formation of gelling magnesium soaps (particularly those of dibasic acids) which tend to solidify the paint.

Other formulations incorporating Lanalose for oil paint include, Lanalose with esterified gum and Lanalose with linseed oil and gum. The formulation incorporating linseed oil produces an exceptionally good gloss paint with excellent weathering properties.

A. ELDER REED & CO., LTD., 103 Battersea High Street, London, S.W.11, inform us that, in consequence of the institution of a five-day week, its offices and warehouse will not be open on Saturdays.

Overseas News Items

Tetra-ethyl Lead Plant Closes.—The tetra-ethyl lead plant at Atzcanotzalco in Mexico has been shut down, apparently because it was considered unprofitable to operate.

U.S. Tin Price Raised.—The United States Reconstruction Finance Corporation has raised the price of tin by 10 cents to 80 cents per pound for April delivery, following a new contract with Bolivian producers.

Malayan Rubber Output.—Rubber output in the Malayan Union during February totalled 50,003 tons. Exports amounted to 59,716 tons. Stocks at the end of the month stood at 103,399 tons, including 10,930 tons awaiting shipment overseas.

Sweden, Hungary Plan Oil Refineries.—New petroleum refineries will, according to the *Petroleum Press Service*, be erected in Sweden and in Hungary. The *Rederi A/B Transatlantic* and the mining concern *Stora Kopparsberg Bergslags A/B* have formed a new enterprise, with a nominal capital of 15,000,000 kr., to operate a refinery, probably near Gothenburg. As regards the new Hungarian project, the Soviet-Hungarian Oil Co. plans to erect a large plant at Pécs, thus increasing the present insufficient refining capacity.

World Mineral Development.—United States private capital has a mutual interest with nations seeking increased mineral production and must co-operate in solving the " major world problem of increasing mineral production," Mr. Spruille Braden, Assistant Secretary of State for American Republic Affairs, told the Institute of Mining and Metallurgical Engineers recently. Mr. Braden, former mining engineer and operator, emphasised the responsibilities of American capital in helping to develop the mineral productivity of the world.

Sale of Canadian Chemical Plant.—There have been informal talks between the Governments of Canada and the United Kingdom concerning the sale of the Welland Chemical plant near Welland, Ont., according to a spokesman for the Department of External Affairs. These have been brought about by the British Government's concern over the sale of the plant by Canada to an American firm, North American Cyanamid. However, there is no indication yet as to why the British Government should question the Canadian action. The sale of the plant was made early in December last. Previously it had been expected that the plant would obtain orders from Britain for production of picrite, a flashless explosive.

U.S. Rubber Control.—Though the United States Government has ceased to be the sole importer of rubber into America—the president having signed the bill terminating the Government's purchasing programme—Government control of rubber allocation and distribution is extended to March 31, 1948.

Tin Recovery Slow.—In his annual review for 1946, the Chief Inspector of Mines, Malayan Union, attributes the slow rate of recovery in the tin industry to inadequate coal supplies, delay in delivery of plant and equipment from overseas, and lack of maintenance of power stations by the Japanese, and also to local factors. The coal position is likely to retard tin production in the first half of this year, according to the inspector.

Poland's Petroleum Output.—Poland produced 705,000 barrels of crude petroleum during the first ten months of 1946. Of the 29 development wells drilled during this period, 21 were oil producers and eight were dry holes. There was no exploratory drilling. Imports of petroleum and products into Poland during the January-October period amounted to 2,636,000 barrels, comprising the following products (in thousands of barrels): Crude petroleum, 96; aviation gasoline, 64; motor fuel, 1,201; kerosene, 668; distillate and diesel oil, 492; lubricating oils, 115.

Calcium Chloride Short.—Shortage of calcium chloride has caused curtailment of the dust-laying programme for county roads in Waterloo, Ontario, where it has been the practice to give an application of calcium chloride at the end of April, but notification has been received from firms supplying that all calcium chloride for road purposes has been reduced ten per cent. The county used 535 tons of the chemical last year. Last year's strike at the Brunner-Mond plant at Amherstburg and the fact that calcium chloride has many more uses since the war are the two factors shortening supply.

Soda Ash Shortage in U.S.A.—The U.S. soda ash industry which produced about 4,368,000 tons last year is unable to cope with industry's demands estimated at 5,000,000 tons. Glass-makers who used 1,320,000 tons of soda ash in 1945 need more, while other soda ash using industries are operating above their war-time peak levels. To try to cope with the increased demand several expansions of producing plant have been scheduled. But until the shortage, which will last at least a year, has been overcome the war-time voluntary plan of distribution is to continue.

Copper Ore to Germany.—Copper ore from Cyprus is being imported into Germany where it is being refined and sent to England. A percentage of bi-products is being retained.

Czech Technical Porcelain Factory.—The United Factories for Technical Porcelain are to build a new factory at Louny in Czechoslovakia, employing about 1500 persons.

Canada's Chemical Exports.—Canadian exports of chemical and allied products in 1946 totalled £16,897,000 in value, compared with £27,829,000 in 1945.

Dutch Tin Prices Raised.—The Dutch domestic selling price of tin has been raised 62 guilders to 472 guilders per 100 kilos delivered from works, according to London metal dealers. This is equivalent to approximately £448 12s. per ton.

Egypt's Oil Reserves.—A geologist of the Socony-Vacuum group has estimated Egypt's known oil reserves at around 67 million tons, with possible new discoveries of the same magnitude. Production to date totalled about 18 million tons, reports the *Petroleum Press Service*.

Czech Steel Production.—Big increases in home production in 1947 of coal, iron and steel, already substantially larger than at the end of the war, are planned in Czechoslovakia. Raw steel produced in 1946 amounted to 1,668,000 tons (2,318,000 in 1937) and the target this year is 2,200,000 tons.

"Refugee" Industries in Canada.—Chemicals and allied products are among those being produced by 65 "refugee" firms in Canada—firms of foreign origin—the establishment of which is being officially encouraged. A survey in 1944 showed there were then four plants producing chemicals and allied products, with a gross output valued at £87,247.

Switzerland's Chemical Exports Up.—According to official statistics, Switzerland's chemical exports (in million Swiss francs), increased from 41.9 in January to 42.2 in February. Shipments of dyestuffs totalled 18.3 (17.7), exports of pharmaceutical products and of aromatics rose by 0.1 to 17.5, while industrial chemicals declined from 6.8 to 6.4.

Britain's Exports Increase.—Despite the great effort which has been made in Switzerland to develop the home chemical industry, imports of chemicals from Britain this year are nine times greater than they were in 1938. America secured the largest increase in the Swiss market, supplying in January-November, 1946, 16 per cent of the total imports (U.K., 5.8), as compared with 7.8 per cent in the 1938 period.

U.S. Steel Output.—U.S. output of steel ingots reached a new peacetime record in March at 7,285,000 tons, against the previous record of 7,213,000 tons.

Coloured Steel in Russia.—Large-scale production of coloured steel is reported to have begun in the Ural metal plants in Russia. One type is gold-coloured, another pink.

Chile's Copper Exports. — Exports of copper from Chile in the first quarter of this year was 79,381 metric tons, compared with 91,769 metric tons in the same quarter of 1946.

Malaya Tin Exports.—Shipments of tin from Malaya in the first quarter of this year totalled 5888 tons, it is announced by the Straits Trading Company, 230 tons going to the United Kingdom; 3735 to Europe; 1225 to India; and 600 to Canada.

Rhodesia Broken Hill Output.—Output of the Rhodesia Broken Hill Company for March was 1815 tons of zinc and 1330 tons of lead, as compared with 1650 and 1170 tons respectively in February. There was again no production of fused vanadium.

Oil Search in Australia.—The Vacuum Oil Co., in conjunction with Consolidated Zinc Corporation and D'Arcy Exploration Co., is to accelerate its efforts to locate any substantial deposits of petroleum in Australia and the immediate environs. America's leading petroleum geologist, Dr. Reeves, has arrived to investigate selected areas.

More Steel and Chemicals.—Increased exports to Britain of Belgian steel, possibly 23,000 tons per quarter, are being discussed by a British Government delegation with the authorities in Brussels. Agreement has been reached in principle to acceptance of increased exports of chemical products and several other commodities.

Malayan Rubber.—Exports of all grades of rubber from Malaya in 1946 totalled 305,840 tons, of which the U.K. received the largest share, 89,388 tons of sheet and crepe. Total production in Malaya in 1946 was 403,207 dry tons and imports 34,327 dry tons, principally from Sumatra and Siam, which provided 23,861 and 9316 tons respectively.

Quebec Fertiliser Plant.—International Fertilisers, Ltd., Quebec City, is erecting a new plant at Wolfe's Cove, Sillery, Quebec, which will serve as new premises for the present plant in Quebec City. It is expected to be in full operation by August or September. The present plant at Quebec manufactures compound fertilisers only. The new factory will produce granular compound fertilisers of all grades.

Personal

MR. F. P. HANN has resigned from the board of Powell Duffryn, Ltd.

MR. T. C. L. WESTBROOK has joined the board of British Emulsifiers, Ltd.

MR. M. L. FORSTER and MR. C. S. HARRISON have become directors of Forster's Glass, Ltd.

MR. RICHARD LAW, M.P., has been appointed to the board of Boots Pure Drug Co., Ltd., to fill a vacancy caused by the resignation of Viscount Mersey.

MR. R. H. STOKES, of Auckland, New Zealand, chemistry research worker and university lecturer, has been awarded the Meldola Medal by the Royal Institute of Chemistry, London.

The late MR. C. K. CROSLAND, Penrhyn Bay, Llandudno, formerly of Edgerton, Huddersfield, chemical manufacturer, a director of L. B. Holliday & Co., Ltd., aniline dye manufacturers, Huddersfield, left £5957.

MISS JOYCE E. MCFARLANE, metallurgist and chemist in charge of the laboratory of the Mirrlees Watson Co., Ltd., Glasgow, recently spoke on "The Production of Sound Iron Castings" to members of the Scottish Engineering Students' Association in Glasgow.

DR. MARGARET M. J. SUTHERLAND, senior lecturer in inorganic chemistry in the School of Chemistry, Royal Technical College, Glasgow, and associated with the College for forty-two years, has retired. She was honoured at a meeting of the staff and friends recently.

As from April 1, 1947, MESSRS. W. A. and E. P. JENKINS have joined the board of Robert Jenkins & Co., Ltd., Rotherham (Welded Steel Fabrications). There are now three grandsons and three great grandsons of Robert Jenkins, J.P., the founder of the firm, on the board.

MR. GEORGE H. THOMSON, B.Com. (Hons.), A.L.A.A., has been appointed by the governors of the Royal Technical College, Glasgow, as secretary of the college in succession to Mr. Alexander Mackay, F.C.I.S., who will retire on August 31 after having been in the service of the college for 43 years. Mr. Thomson is at present clerk and treasurer to Dundee Institute of Art and Technology.

MR. J. M. THORNLEY has recently been appointed by Messrs. E. Boydell & Co., Ltd., as their representative for Scotland. Mr. Thornley, who has a specialised knowledge of gear boxes and driving axles, has been with Messrs. E. Boydell & Co., Ltd., for the past eighteen years and has been closely associated with the technical and practical investigations which have resulted in the evolution and production of their products.

MR. H. SCOTT BUTTERWORTH, chairman and manager of Ash Spinning Co., Ltd., Shaw, has been elected president of the Master Cotton Spinners' Federation in Manchester. MR. J. LINDLEY, managing director of Peel Mills, Rochdale, is the new senior vice-president. MR. GEORGE HASTY, managing director of Grape Mill, Royton, and president of Oldham Master Cotton Spinners' Association, was elected junior vice-president.

Presentations by the staff and maintenance workers of the Castner-Kellner Works, Weston Point, were made recently to MR. J. W. B. HOLLINS, chemical engineer of the works, on his retirement, which concludes a lifelong connection with the chemical industry on Merseyside. His career began in the experimental laboratory of Mr. James Hargreaves, at Farnworth, and he helped to commercialise the electrolytic method of manufacture of chlorine and soda products. More recently, he spent three years in Finland as engineer in charge of the construction of Finnish Chemicals, Ltd.

MR. SYDNEY H. APPLEYARD has begun his duties as personnel manager at Stork Margarine Works, Bromborough. In 1930 he took charge of the production of edible fats at British Creameries, Ltd., Hull, and was works manager from 1940 until he went to Bromborough. MR. JOHN D. BUXTON, who is to help MR. T. J. MARCHAND, assistant general works manager at Stork Margarine Works, began with Lever Bros., Ltd., at the Port Sunlight analytical laboratories, and was transferred to the hardening plant, Bromborough. Appointed to the overseas executive of the company for a special investigation, he spent some months in Malaya.

Obituary

MR. CYRIL S. GRAHAM, Orb Lane, Scunthorpe, 57-year-old chief metallurgical chemist at the Normanby Park Steelworks, Scunthorpe, was found dead in bed recently.

Chemical Works Fire.—Wrexham, Johnstown and Acrefair N.F.S. detachments were called out on April 10 to aid the works brigade in fighting a fire at Monsanto Chemical Works, Cefn. The fire was under control within half an hour, and the damage was not serious.

Home News Items

Warrington Exhibition.—Baron Dubeston will open the town's centenary industrial exhibition in Parr Hall, Warrington, on April 19.

Asbestos Strike.—The unofficial strike of 1800 workers over a bonus dispute, at Turner's asbestos works, Farnworth, Widnes, ended on April 11. The firm are manufacturers of all kinds of asbestos materials which are urgently required by the building trade.

Output of Copper.—Output of main copper and copper alloy products in the United Kingdom in February was 29,395 tons, of which copper content was 23,047 tons. Output of unalloyed copper was 11,655 tons; alloyed copper 16,406 tons; and copper sulphate 1334 tons.

Weathering Tests.—The effect of many years of exposure to the weather has been simulated during tests on asbestos-cement roofing material at the Building Research Station. Specimens from existing buildings were examined as well as new materials sent by manufacturers. Results are given in "Building Research Technical Paper No. 29—Weathering Tests on Asbestos-Cement Roofing Materials," published today by H.M.S.O., Kingsway, London, W.C.2 (price 1s.).

Surplus War Equipment.—George Cohen, Sons & Co., Ltd., have signed a contract with the Ministry of Supply for the acquisition of the whole of the plant and equipment accumulated at the main collection depot for war surplus at Avant-Port, Brussels. The purchase includes a vast amount of unused engineering equipment and stores, notably electric generating sets, transformers, pumping equipment, etc. The plant will be available for export from Belgium, and items can be imported into Great Britain providing an Import Licence is obtained.

Oil Fired Smelting Furnace.—The first oil fired steel openhearth smelting furnace in Scotland, the M.O.S. Linnwood, Paisley plant, operated by Wm. Beardmore and Co. Ltd., has now been proved a definite success. The conversion of two further furnaces at this site will follow and afford a weekly saving of some 750 tons of coal previously used for making producer gas. In its place 330 tons of oil are being used instead, while a variety of devices have been designed to facilitate either a continued use of oil, or a reversion to producer gas should this be regarded as necessary.

Steel Production Cut.—The first large-scale evidences of the effects of the fuel crisis are the substantial reductions shown in the returns for pig iron and steel production in the United Kingdom in February. Weekly average output of pig iron was 126,200 tons, compared with 146,000 in February, 1946, and of steel ingots and castings 206,300, against 247,200 tons. Steel production was at an annual rate of 10,726,000 tons, compared with 12,470,000 tons in January.

New Scottish Office.—The British Aluminium Co., Ltd., is to transact its own business in Scotland, formerly undertaken for more than 50 years by Messrs. Alexander Brown & Co., as from July 1, at a Scottish branch office at 113 West Regent Street, Glasgow, C.2 (telephone: Douglas 6528), of which Mr. P. J. Ferguson will be manager. Messrs. Alexander Brown & Co. will continue after July 1 to accept orders for execution from stock but will not deal with bulk orders.

New Atomic Energy Centre.—A factory at Springfield Salwick, near Preston, which was one of the chemical defence plants during the war, is being converted by the Ministry of Supply into an atomic energy centre for the producing of uranium metal. Processes to be carried out there will consist of the refining of pitchblende concentrates, reduction to metal and machining and finishing uranium metal rods. It is hoped that building and plant will be sufficiently advanced for production to begin in the late autumn.

Fertiliser Manufacturers in U.S.—An official delegation from the Fertiliser Manufacturers' Association is now on a visit to the National Fertiliser Association Incorporated of Washington, D.C., and the Canadian Fertiliser Association. The deledation includes Mr. D. J. Bird, president of the Association; Mr. A. T. Vernon, vice-president; Mr. E. P. Hudson, representing Scottish manufacturers of superphosphate and compound fertilisers; Mr. A. E. Sell, vice-president of the Fertiliser Society. The delegation proposes to visit the American and Canadian factories producing phosphate and compound fertilisers and will study in particular latest developments in manufacture and handling, bagging and distribution arrangements. While the delegation is not a Government body it has the support of the Board of Trade. It is intended to act as a goodwill mission and to convey to American fertiliser manufacturers the thanks of the British industry for their extensive war-time contribution to the fertiliser needs of the British Isles.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ARMSTRONGS (CAMBRIDGE) LTD. (formerly ARMSTRONGS (CHEMISTS), LTD.). (M., 12/4/47.) March 4, £2000 (not ex.) mortgage, to Lloyds Bank, Ltd.; charged on 5-7 Norfolk Street, Cambridge.

DENVER CHEMICAL & METAL REFINING CO., LTD., London, E.C. (M., 12/4/47.) March 3, charge, to Barclays Bank Ltd., securing all moneys due or to become due to the bank; charged on land on south side of Thames Road, Barking.

H. & G. PLACE & CO., LTD., Broadheath, dealers in chemicals. (M., 19/4/47.) March 12, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on land with buildings thereon formerly Sale High School for Boys, Poplar Grove, Brooklands.

E. N. T. MANUFACTURING CO., LTD., Bristol, manufacturing chemists. (M., 19/4/47.) March 7, mortgage, to National Provincial Bank, Ltd., securing all moneys due or to become due to the bank; charged on dwelling house, factory and land at Quarry Road, Kingswood, Bristol, together with plant, machinery, etc. *£750 and fluctuating. October 17, 1942.

Satisfaction

STOCKTON CHEMICAL ENGINEERS & RILEY BOILERS LTD., London, W. (M.S., 12/4/47.) Satisfaction March 4, of debentures registered July 16, 1938, to the extent of £1,000.

Companies Winding-up Voluntarily

WESTON FERTILISERS, LTD. (C.W.U.V., 19/4/47.) March 13.* Mr. C. Y. Lloyd, 2 Cooper Street, Manchester 2.

CELLOMOLD, LTD. (C.W.U.V., 19/4/47). March 31.*

EXTRUDED PLASTICS, LTD. (C.W.U.V., 19/4/47.) March 31.*

INDURITE MOULDING POWDERS, LTD. ((C.W.U.V., 19/4/47.) March 31. Mr. H. N. Butler, F.C.A., 4 St. Mary Axe, London, E.C.3, and Mr. R. D. Brewis, F.C.A., 56 Cannon Street, London, E.C.4.*

* This notice is purely formal ; The companies are being wound up only for the purpose of reconstruction.

Company News

Net profit of £41,051 (£20,966) was made in 1946 by **Sternol, Ltd.**

It was reported at the annual meeting of **Doulton and Co., Ltd.**, that the year's profit of £173,000 was nearly £100,000 more than in the previous year, enabling the dividend to be raised by 2½ per cent.

A profit on the past year of £44,332 (£32,200) and a final dividend of 17½ per cent, making a total dividend of 30 per cent (same), is announced by British Lead Mills, Ltd.

An increase of £21,000 in profits on trading account for the year—the round figure totalling £76,000—was reported at the annual meeting of **Viscose Development Co., Ltd.** Net profit of £34,292 was £22,812 more than the previous year's figure.

Following its announcement in March that it plans to raise $100,000,000 of additional capital for its proposed programme of plant expansion, **E.I. Du Pont de Nemours and Co.** has, it is reported from New York, filed a registration statement with the Securities and Exchange Commission covering one million shares of no-par preferred stock.

The " best trading year experienced " by **British Paints (Holdings), Ltd.**, was that to March 31, according to the statement of the chairman, Mr. J. W. Adamson, presenting the accounts, which showed a record combined profit for the group of £387,949 (£281,066). Sales showed a large increase, he stated. Export sales for 1947 will be seriously handicapped, he added, however, because of the small allocation of linseed oil for export paints.

Completion of negotiations is announced by **Fisons, Ltd.**, manufacturers of chemical fertilisers, chemicals, etc., for the acquisition of the share capital of Whiffen and Sons, Ltd., Fulham, manufacturing chemists and drug grinders. Fisons intends to transfer the shares to Genatosan Trust, and Whiffen and Sons and Genatosan will work together in close co-operation. Mr. Goodman Whiffen, chairman, and Mr. Stanley Whiffen and Mr. Noel Whiffen will remain on the board of Whiffen and Sons.

An announcement by **National Plastics, Ltd.**, states that it has acquired the shares of De La Rue Plastics, Ltd., from Thomas De La Rue and Co., Ltd., and that as from April 9, 1947, the name will be changed from De La Rue Plastics, Ltd., to British Moulded Plastics, Ltd. Scottish Plastics, Ltd., and Lanarkite, Ltd., formerly subsidiaries of De La Rue Plastics, Ltd., will now become subsidiaries of British Moulded Plastics, Ltd. An offer is being made to the shareholders of Moulded Products, Ltd., to acquire their shares and a further announcement will be made.

Chemical and Allied Stocks and Shares

WITH Budget uncertainties no longer restraining business, dealings for the new Stock Exchange account have been on a larger scale and values moved upward in most sections under the lead of British Funds. The latter were stimulated by Mr. Dalton's latest views on the "cheaper money" policy, and with prices higher in this section an upward trend has been stimulated in other directions, notably leading industrial shares, which were generally higher.

Imperial Chemical have been active around 47s. 3d., the assumption being that last year's marked increase in profits was probably not exceptional and may be exceeded in future. Dunlop Rubber were active and higher at 73s. on the possibility of an increased payment for the past year, while Turner and Newall were 86s. and Borax Consolidated deferred 58s. 9d., there being a tendency to favour shares of companies with important overseas and export trade interests. Fisons were 60s., following news of the company's latest acquisition, and W. J. Bush remained held tightly and quoted at 92s. 6d. B. Laporte were also 92s. 6d.; Lawes Chemical 15s. 9d.; and Major & Co's ordinary 4s. Elsewhere, Greeff Chemicals Holdings 5s. ordinary have changed hands around 14s. 6d., while William Blythe 3s. shares at 17s. 3d. remained under the influence of the good financial results.

Colliery shares were slightly higher, where changed, and iron and steels inclined to attract attention in view of the big yields and apparently good prospects of dividends being maintained. Dorman Long, United Steel and Guest Keen tended to improve, and Colvilles at 26s. 9d. firmed up on further consideration of the big increase in profits for the past year. Ruston & Hornsby have risen further to 64s. 3d., and higher dividend possibilities strengthened Allied Ironfounders to 62s. 6d. Staveley were 58s. 9d. and Shipley 46s. 6d. Elsewhere, however, tinplate shares became less firm, Thomas and Baldwins being 13s. 9d. and Baldwins (Holdings) 7s. 10½d., but later, prices rallied.

In other directions, units of the Distillers Co. have changed hands up to 138s. 6d. De La Rue were 58s. 9d.; British Xylonite £8; and British Industrial Plastics 9s. Amalgamated Metal at 19s. and Imperial Smelting 20s. 3d. were around the same prices as a week ago, but British Aluminium have strengthened to 47s. 1½d. British Glues moved slightly higher at 17s. 3d. Metal Box shares firmed up to 111s. 3d., and Tube Investments to £6⅝. Paint shares have remained firm under the lead of Pinchin Johnson, which further advanced to 60s., but later eased despite the big dividend increase. Aided by further consideration of the full results, General Refractories have risen afresh to 22s. 7½d. British Plaster Board were 32s. 3d., and Associated Cement rose to 66s., and Tunnel Cement advanced to 52s. 6d. on the dividend. Blythe Colour Works rose further to 55s.

Boots Drug were 60s. 6d. earlier in the week, with Beechams deferred 26s. 9d., Griffiths Hughes 62s. 6d. Sangers 35s., and Timothy Whites 48s. 3d. Oils eased but later became active, with Shell attracting rather more attention on hopes of a higher dividend. C. C. Wakefield also responded to the possibility of an increased distribution, and Mexican Eagle shares remained active.

British Chemical Prices

Market Reports

A FIRM tone continues to be displayed in all sections of the chemical market and price adjustments, where made, have been to higher levels. Buying for home account has been fully sustained and deliveries to the chief industrial consuming industries are being maintained on a fairly good scale. The volume of export orders shows no sign of diminishing though suppliers in many cases are unable to hold out any prospects of early delivery dates. Most of the soda products are in active request with some improvement in the production position. The potash chemicals continue scarce. Sulphate of copper is again dearer as a result of the further increase in the price of the metal and there is a good call for lead oxides at the recently increased rates. There is little of interest to report from the coal-tar products market except that pressure for supplies is reducing the quantities available for export.

MANCHESTER.—Fuel difficulties continue to influence both production and consumption of heavy chemical products in the Lancashire district, though some slight improvement in the allocations of coal in the coming weeks is looked for. In the meantime, a steady absorption of supplies of pretty well all descriptions of chemicals has been reported on the Manchester market during the past week and fresh inquiries have related to shipping as well as to home trade requirements in the alkali products and the ammonia and magnesia compounds, among others. There is steady pressure for supplies of several descriptions of fertilisers, and the tar products, both light and heavy, are meeting with a good demand.

GLASGOW.—The supply position in the Scottish heavy chemical trade during the past week has shown some slight improvement, although it still remains difficult. There has been no change in the export market.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Monoalkamine esters of 1, 2, 4.-trimethyl pyrrole-5-carboxylic acid.—American Cyanamid Co. July 31, 1943. 12227/44.

Heavy-media separation process.—American Cyanamid Co. Sept. 26, 1945. 25567/46.

Hollow casting moulds. — Austenal Laboratories, Inc. Feb. 26, 1944. 6291/47.

Core in casting process. — Austenal Laboratories, Inc. June 3, 1943. 6520/47.

Hollow casting moulds. — Austenal Laboratories, Inc. Sept. 27, 1941. 6521/47.

Preparing pure crystaline salts of penicillin.—Commercial Solvents Corporation. Sept. 28, 1945. 26323-24/46.

Cell for the refining of aluminium.—Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges, & Camargue. Sept. 26, 1945. 26468/46.

Adsorption.—Distillation Products, Inc. Sept. 26, 1945. 10231/46.

Mechanical support for insulators.—A. B. Du Mont Laboratories, Inc. Sept. 26, 1945. 27200/46.

Polymeric materials.—E. I. Du Pont de Nemours & Co. Sept. 26, 1945. 28624/46.

Portable apparatus for holding and vapourising liquified gases.—Linde Air Products Co. April 11, 1945. 9549/46.

Shoe for thermochemical desurfacing machine.—Linde Air Products Co. Sept. 27, 1945. 25295/46.

Derivatives of N-cyano alkyl dithiocarbamic acids. — Monsanto Chemcal Co. June 9, 1945. 6330/47.

SITUATIONS VACANT

ANALYST required for Public Analyst's Laboratory in Central London. Good and interesting experience obtainable. Salary £350 to £500, according to qualifications. Apply Box No. 2442, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

AN old-established Chemical Factory in Hertfordshire requires an Engineer to take charge of the maintenance of all plant and buildings, and, with the appropriate staff, to assist in the planning and execution of a development programme. Applicants should have a sound knowledge of steam generation and utilisation, and have some experience of chemical plant design and layout. The post offers good opportunities for a qualified man. Initial applications should be by letter, giving summary of experience and qualifications. Box No. 2440, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMICAL Engineer wanted, familiar with large scale wet processes for the production of oxides of chromium and other metals for works in midlands. Attractive progressive position for capable man. Please write full details to Box No. 2439, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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CHIEF OF PLANNING DIVISION required for management of industrial development of large Petroleum Group. Age 35 to 40. Salary £2,500 to £3,000, provident fund and pension benefits. Candidates must have good honours degree in Chemistry and not less than ten years' experience in the British chemical industry, preferably with experience in research, manufacturing and marketing. Apply in writing, giving full particulars of age, education and experience, to Box ZG437, DEACONS ADVERTISING, 36, Leadenhall Street, London, E.C.3.

ENGINEER for London Office, age 30-40, preferably qualified for specialised plant installation. Drawing office experience. Chemical knowledge desirable. Interesting and responsible job with opportunity for rapid advance for man with initiative. Apply Regent 0856 for Box No. 2450, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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CHEMISTS OR ENGINEERS required for supervision of chemical processes. Some shift work necessary in the early stages. Initial salary in the order of £450 per annum. Reply, giving full details of age, qualifications and experience, to Box No. 2443, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PLANT Chemists urgently required for Process Plant Operation by large company operating in the Middle East. Applicants need not be Graduates but should have had a chemical training up to Inter. B.Sc. or National Certificate Standard with experience of shift work in either a gas, coke oven or chemical works. Age not over 30. Salary in sterling between £540 and £600 per annum, plus generous allowances in local currency, with free furnished bachelor accommodation, passages out and home, medical attention, also kit allowance and Provident Fund benefits. Apply, stating age, qualifications and experience, etc., to Dept. F.22, Box No. 2435, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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DIPLOMA Chemist and Metallurgist, 28, single. Non-ferrous metals four years' experience. Energetic, adaptable, good organiser, seeks post Great Britain or overseas. Box No. 2451, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

BUSINESS PROPOSITION

ADVERTISERS at present engaged in forming a Limited Liability Company with a capital of £35,000 to take over the large stock of raw and semi-processed materials (in the U.K.) together with the exclusive mining and selling rights for **barytes, bentonites, kieselghurs, mineral blacks, ochres, pumices, talcs,** etc., from well-known French deposits and works, invite applications from responsible persons willing to participate actively or not in the early realisation of a well-planned programme of an almost unlimited scope and already assured of large profits. Minimum subscription, £1,000 in 7½ per cent. Cumulative Redeemable Preference shares. Bankers' and other references offered and required. Principals only. Box No. 2449, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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NEW 20-gallon Stainless Steel Storage Tanks, mounted on welded skirt band, complete with loose fitting lid, two carrying handles. No outlet.

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SEVEN—3,000 g.p.h. Gwynne All-electric Centrifugal Pumping Sets, 60 ft. head; Crompton Parkinson 3 h.p. motors, Allen West starters 400/3/50 with gauges, valves, fittings, spares, etc.
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ONE—8 in. dia. by 20 in. long Triple Angular Granite Roll Paint Refiner by Brinjes & Goodwin. Machine-cut gears. Fast and loose pulley drive.
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ONE—42 in. latest type All-electric Underdriven Hydro by Manlove Alliott, 400/3/50 cycles. Lift-out basket and electric interlock safety cover.
THREE—300 g.p.h. De Laval Industrial Separators, with in-built motors and pumps. 400/3/50. Complete with tools, spanners, etc.
THREE—300 g.p.h. ditto. machines by Hopkinson.
THREE—120 g.p.h. Units by Hopkinson.
TWO—100 g.p.h. Units by De Laval.

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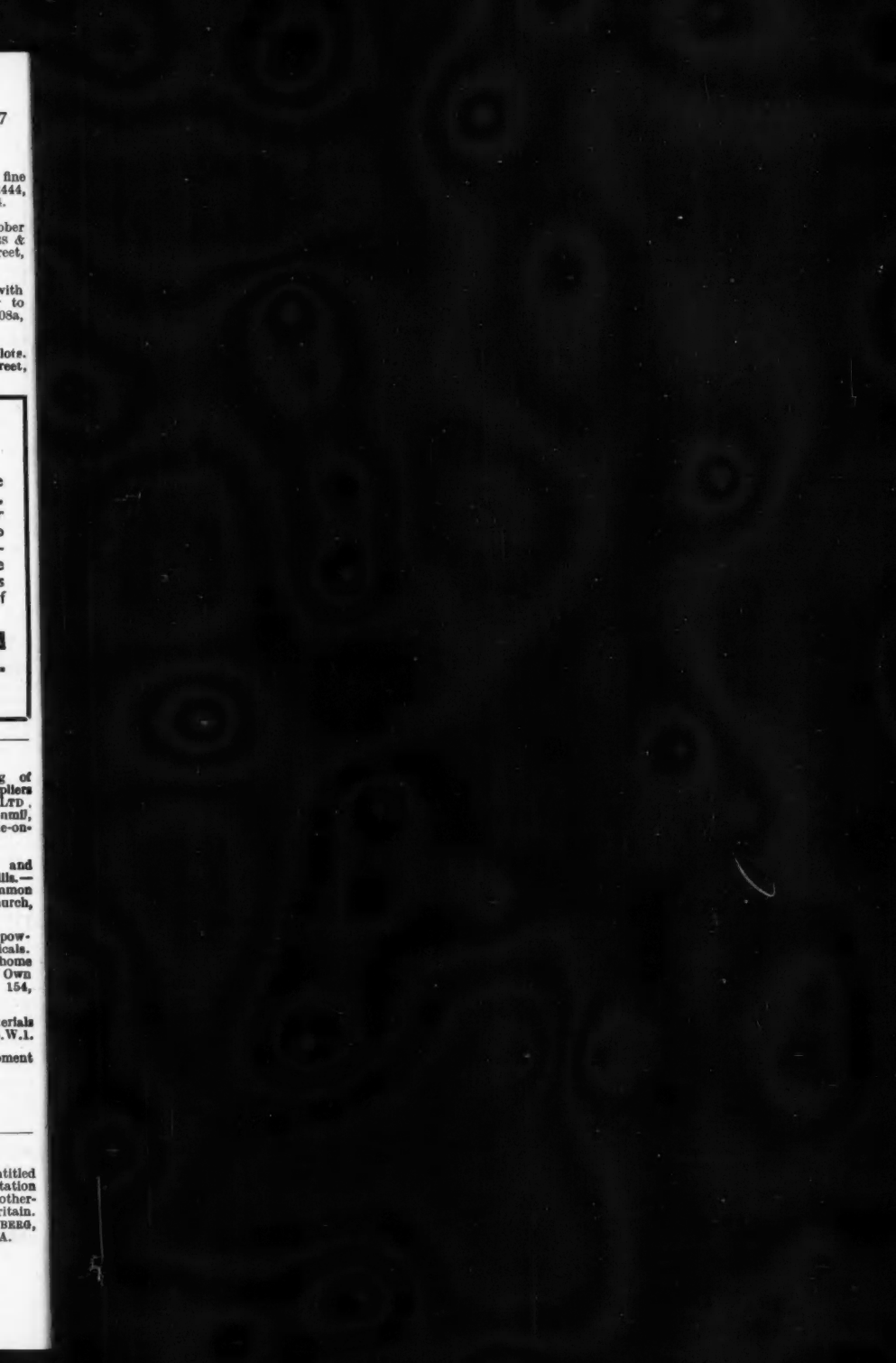

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